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For related information see also *Astronautics*.

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VOLUME 18 NUMBER 1/JANUARY 8, 1980

TABLE OF CONTENTS

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

01 AERONAUTICS (GENERAL) 1

02 AERODYNAMICS 12

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

03 AIR TRANSPORTATION AND SAFETY 20

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION 20

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command and Tracking* and *32 Communications*.

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE 25

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

06 AIRCRAFT INSTRUMENTATION N.A.

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

07 AIRCRAFT PROPULSION AND POWER 27

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

08 AIRCRAFT STABILITY AND CONTROL 31

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

09 RESEARCH AND SUPPORT FACILITIES (AIR) 32

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

ASTRONAUTICS

Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

For related information see also *Aeronautics*.

12 ASTRONAUTICS (GENERAL) 33

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

13 ASTRODYNAMICS N.A.

Includes powered and free-flight trajectories; and orbit and launching dynamics.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) 37

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research and Support Facilities (Air)*.

15 LAUNCH VEHICLES AND SPACE VEHICLES 37

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

16 SPACE TRANSPORTATION 37

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING 38

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 38

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

19 SPACECRAFT INSTRUMENTATION N.A.

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

20 SPACECRAFT PROPULSION AND POWER 38

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; and propellants and fuels.

23 CHEMISTRY AND MATERIALS (GENERAL) N.A.

Includes biochemistry and organic chemistry.

24 COMPOSITE MATERIALS 44

Includes laminates.

25 INORGANIC AND PHYSICAL CHEMISTRY 45

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

26 METALLIC MATERIALS 47

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS 50

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

28 PROPELLANTS AND FUELS 52

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

ENGINEERING

Includes engineering (general); communications; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.

For related information see also *Physics.*

31 ENGINEERING (GENERAL) 58

Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 COMMUNICATIONS 58

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

33 ELECTRONICS AND ELECTRICAL ENGINEERING 59

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

34 FLUID MECHANICS AND HEAT TRANSFER 62

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

35 INSTRUMENTATION AND PHOTOGRAPHY 67

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation.*

36 LASERS AND MASERS 68

Includes parametric amplifiers.

37 MECHANICAL ENGINEERING 70

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY 71

Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS 72

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

GEOSCIENCES

Includes geosciences (general); earth resources; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.

For related information see also Space Sciences.

42 GEOSCIENCES (GENERAL) N.A.

43 EARTH RESOURCES 76
Includes *remote sensing of earth resources* by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography*.

44 ENERGY PRODUCTION AND CONVERSION 83
Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.
For related information see also *07 Aircraft Propulsion and Power*, *20 Spacecraft Propulsion and Power*, *28 Propellants and Fuels*, and *85 Urban Technology and Transportation*.

45 ENVIRONMENT POLLUTION 94
Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

46 GEOPHYSICS 97
Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.
For space radiation see *93 Space Radiation*.

47 METEOROLOGY AND CLIMATOLOGY 99
Includes weather forecasting and modification.

48 OCEANOGRAPHY 101
Includes biological, dynamic and physical oceanography; and marine resources.

LIFE SCIENCES

Includes life sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and planetary biology.

51 LIFE SCIENCES (GENERAL) 102
Includes genetics.

52 AEROSPACE MEDICINE 106
Includes physiological factors; biological effects of radiation; and weightlessness.

53 BEHAVIORAL SCIENCES 109
Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT 111
Includes human engineering; biotechnology; and space suits and protective clothing.

55 PLANETARY BIOLOGY N.A.
Includes exobiology; and extraterrestrial life.

MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) N.A.

60 COMPUTER OPERATIONS AND HARDWARE 112
Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

61 COMPUTER PROGRAMMING AND SOFTWARE 113
Includes computer programs, routines, and algorithms.

62 COMPUTER SYSTEMS 116
Includes computer networks.

63 CYBERNETICS 116
Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support*.

64 NUMERICAL ANALYSIS 116
Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY 118
Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS 119
Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS 119
Includes topology and number theory.

PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.
For related information see also Engineering.

70 PHYSICS (GENERAL) 120
For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar Physics*.

71 ACOUSTICS 120
Includes sound generation, transmission, and attenuation.
For noise pollution see *45 Environment Pollution*.

72 ATOMIC AND MOLECULAR PHYSICS 120
Includes atomic structure and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS 122
Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation*.

74 OPTICS 124
Includes light phenomena.

75 PLASMA PHYSICS 126
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

76 SOLID-STATE PHYSICS 128
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

77 THERMODYNAMICS AND STATISTICAL PHYSICS 131
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) N.A.
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT N.A.
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE 132
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software*.

83 ECONOMICS AND COST ANALYSIS 132
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE 133
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 133
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences*.

88 SPACE SCIENCES (GENERAL) N.A.

89 ASTRONOMY 135
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 135
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 136
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

92 SOLAR PHYSICS 137
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 137
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

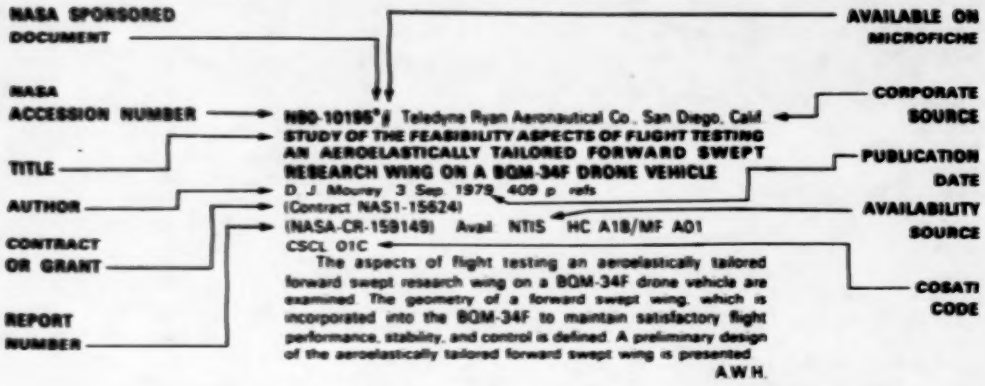
GENERAL

99 GENERAL 137

Note: N.A. means that no abstracts were assigned to this category for this issue.

SUBJECT INDEX I-1
PERSONAL AUTHOR INDEX I-51
CORPORATE SOURCE INDEX I-59
CONTRACT NUMBER INDEX I-71
REPORT/ACCESSION NUMBER INDEX I-75

TYPICAL CITATION AND ABSTRACT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TITLE
STUDY OF THE FEASIBILITY ASPECTS OF FLIGHT TESTING AN AEROELASTICALLY TAILORED FORWARD SWEPT RESEARCH WING ON A BQM-34F DRONE VEHICLE
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The aspects of flight testing an aeroelastically tailored forward swept research wing on a BQM-34F drone vehicle are examined. The geometry of a forward swept wing, which is incorporated into the BQM-34F to maintain satisfactory flight performance, stability, and control is defined. A preliminary design of the aeroelastically tailored forward swept wing is presented.
A.W.H.

ON-GOING RESEARCH PROJECTS

This is a listing of research projects - not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research and Support Facilities (air). For Related Information See Also Astronautics.

1.0001, HELMET MOUNTED DISPLAY (HMD)
R. Lohmann, Hughes Aircraft Co., *Centinela Ave. & Teale St., Culver City, California* 90230 (DN881383; N62269-77-C-0504)

Conduct a three-phase development of an HMD that will have more efficient aircraft weapon control and delivery capability than conventional aircraft weapon control systems. This contract supports work unit ZA601, Agency Accession No. DN681080.

Phase one will demonstrate the feasibility and advantages of a binocular, stereoscopic HMD in order to eliminate retinal rivalry and suppression of display image as may occur in a monocular display, and to add a new dimension of true depth perception in displays. The second phase will involve verification of the concepts developed in phase one and will interface helmet and electronic design with weapon systems. Phase three will be a full-scale development of the improved system.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0002, IMPROVED SYSTEMS FOR POSITIONING AND RESTRAINT FOR EJECTION SEATS
N. Bice, Pacific Scientific Co., *Anaheim, California* 92803 (DN881138; N62269-77-R-0122)

Investigate and develop systems and/or devices to provide improved restraint and pre-positioning for proper body positioning during ejection. This contract supports work unit ZA601, Agency Accession No. DN681080.

A contract has been let to Pacific Scientific Corp. for the design and manufacture of prototype hardware for lower lap belt thrusters, head and neck restraint actuation and separation cutter as an integrated system, developed primarily for the MPES.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0003, DEVELOPMENT AND EVALUATION OF ADVANCED PARACHUTE CANOPY DESIGNS
J.D. Boone, U.S. Dept. of Defense, Navy, National Parachute Test Range, *El Centro, California* 92243 (DN937028)

To improve consistency of parachute canopy operation, simplify manufacturing procedures, improve quality control, reduce opening shock loads, reduce weight and bulk and improve operational envelope as a result of basic design capability. More specifically, a parachute canopy consisting of much less than the approx. 130 pieces in the present 28-ft. flat canopy; reduction in operating forces by use of variable porosity and energy absorbing materials; maintain, as a minimum, the present capabilities; reduce weight and bulk by 20%.

Bulk and weight to be reduced by use of wider fabric and new design and construction to reduce number of seams and reinforcing tapes. New materials to be used where same performance can be obtained with weight and bulk savings. Energy absorbers (peak load limiters) to be used to reduce strength requirements and therefore weight and bulk.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

1.0004, IMPROVED HARNESS RESCUE LINK
D. Goodrich, U.S. Dept. of Defense, Navy, National Parachute Test Range, *El Centro, California* 92243 (DN895416)

Design and qualify a helicopter pick-up link for use on the MA-2 torso harness which incorporates fleet requirements regarding versatility, strength and non-interference on the other aircrew equipment.

Use surveys, interviews, and on-site inspections and UR data to define specific fleet requirements. Design and test appropriate prototype configurations. Select superior configurations and prepare design specifications.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

1.0005, STUDY OF EXPERIMENTS ON CONDENSATION OF NITROGEN BY HOMOGENEOUS NUCLEATION AT STATES MODELLING THOSE OF NATIONAL TRANSONIC FACILITY
P.P. Wegener, Yale University, School of Engineering, Dept. of Engineering & Applied Science, *206 Elm, New Haven, Connecticut* 06520 (NSG 1612)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0006, HIGH PERFORMANCE COMPOSITES AND ADHESIVES FOR V/STOL AIRCRAFT
L.B. Lockhart, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN680029)

The program objective is to develop high-toughness, high-temperature stable resins for use in graphite-fiber composites and as adhesives in V/STOL aircraft, to characterize these materials for quality control and reliability, and to utilize the materials property data for optimized design of a prototype V/STOL structural element.

Developmental and commercial resins that promise to meet the requirements for V/STOL application will be characterized by spectroscopic and thermomechanical analysis. The mechanical performance and fracture behavior of these resins and of the adhesives and composites fabricated from them will be determined. The data will be used for (a) the design optimization of a V/STOL composite and adhesive-bonded structural element, (b) guidance for further improvements in resins, adhesives and composites, and (c) development of quality control parameters.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

1.0007, AIRCRAFT/STORE SEPARATION ANALYSIS
C.W. Pinney, U.S. Dept. of Defense, Air Force, Armament Lab., *Eglin Air Force Base, Florida* 32542 (DF626640)

Air Force function - air delivered weapons. Deficiency or opportunity currently the only known approach to this problem is actual flight tests backed up by limited 'free-drop' wind tunnel testing. The conventional method of wind tunnel store separation testing, the captive trajectory system, cannot be used for multiple bombracks because their geometry precludes adequate installation of mounting hardware and sensing devices to measure the aerodynamic loads. Flight testing to establish multiple bomb rack jettison envelopes is by far the most dangerous of all separation testing especially if adequate predictions and trends are not established prior to the flight tests. At lease one aircraft has been lost during jettison tests. Historically, 'free-drop" wind tunnel tests preceeding flight tests have been limited as this extremely expensive technique requires dynamically-scaled models which are released in the wind tunnel and only about one trajectory can be obtained per hour of wind tunnel testing. As a result of these incomplete investigations multiple bombrack jettison envelopes published for operational use are usually limited to a maximum release speed of 250 to 275 KCAS. This requires that the pilot slow down from normal combat speeds if it becomes necessary to jettison his bomb load, thereby placing the aircraft in a vulnerable position. Objective - to develop a cost-effective semi-empirical computer simulation technique to accurately predict the trajectories of multiple bombracks (empty and with various weapon configurations) jettisoned from high performance aircraft. How work contributes - if successful, this effort will provide a cost-effective method of thoroughly analyzing multiple bombrack separation characteristics throughout the complete aircraft flight envelope, thus enhancing flight safety of jettison testing and possibly expanding jettison envelopes for increased combat effectiveness.

The semi-empirical computer simulation technique that will be used to predict the trajectory of a jettisoned multicarriage bombrack incorporates a six-degree-of-freedom computer program based on the equations of motion and the loads which the bombrack encounters as it passes through the aircraft flow field. These loads are expressed as force and moment coefficients (both free stream and interference) and serve as external inputs to the computer program. (Text Abridged)

SUPPORTED BY U.S. Dept. of Defense, Air Force, Armament Lab.

1.0008, ADVANCED ENGINE CONTROL/DIAGNOSTICS INTEGRATION AND DEMONSTRATION

J. Weber, General Motors Corp., Detroit Diesel Allison Div, *4700 W. 10th St., Indianapolis, Indiana* 46206 (DN889783; N00140-78-C-0027)

The objectives of this program are to develop, verify and demonstrate computer software (control logic) capable of closed-loop control of an advanced variable cycle engine (VCE). The logic developed for demonstration on the joint technology demonstrator (JTD) engine will provide closed-loop control of all engine variables and will provide gradual transients because of the experimental nature of this engine. The control logic will be programmed into the Bendix EH-K1 engine-mounted digital controller for the demonstration. Alternate control logic will be developed for verification via hybrid computer simulation, which will fully demonstrate the VCE features, such as airflow regulation, specific fuel consumption (SFC) optimization, thrust response optimization, etc. The logic will include control system diagnosis as well as some sensor, actuator and engine performance/ condition monitoring.

This program is planned as a two-phase effort of approximately 30 months duration. Phase 1 consists of control logic development, input signal characterization, control diagnostics and engine condition monitoring logic development, software coding and checkout on the hybrid computer, and finally on-engine demonstration during the build-up (BU) 1 test of the JTD engine. Phase 2 will consist of the updating of the control and diagnostic logic, updating and recording the software, and demonstration on the BU 1a test of the JTD engine.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Propulsion Test Center

1.0009, THREE-DIMENSIONAL AERODYNAMICS OF TURBOMACHINES

S. Fleeter, Purdue University, Graduate School, *Executive Bldg., West Lafayette, Indiana* 47907 (NSG 3285)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

1.0010, STRUCTURAL DESIGN OF HELICOPTER AND BALLISTIC SURVIVABILITY

D.F. Haskell, U.S. Dept. of Defense, Army, Armament Research & Development Command, Ballistic Modeling Div., *Aberdeen Proving Ground, Maryland* 21005 (DA0P4473)

To develop an anlytical method for predicting the structural dynamic response of fragment-damaged line and panel composite elements subjected to blast loading.

An optimum structural design technique for helicopter survivability will be developed. Both undamaged and damaged line and panel composite elements will be modeled and their response to blast loading will be calculated. These line and panel elements will then be used to analytically build a composite helicopter primary structural component and study its structural dynamics behavior in the undamaged and damaged conditions.

SUPPORTED BY U.S. Dept. of Defense, Armament Research & Development Command, Ballistic Research Lab.

1.0011, SELF-CONTAINED CARTRIDGE FOR ADVANCED EJECTOR SYSTEMS

W.P. Peck, U.S. Dept. of Defense, Navy, Naval Ordnance Station, *Indian Head, Maryland* 20640 (DN896203)

To investigate self-contained cartridge concepts and apply the resulting technology to advanced ejector systems. The objective is to decrease stores release/ejection equipment maintenance and thus reduce aircraft turn-around time and increase aircraft operational readiness.

A self-contained cartridge design will be investigated which will encapsulate all propellant combustion products. This will provide a totally clean power source for stores release/ejection equipment. The cartridges will be tested in a breadboard ejector system. During FY 78 a cartridge case design will be investigated. Materials will be evaluated for adaptability to deep drawing techniques and the high stress/fatigue encountered during operation. Effort in FY 79 will include finalizing case design concepts based upon FY 78 initial feasibility testing, and investigating propellant formulations which will meet self-contained cartridge performance requirements. New/modified propellant compositions will be evaluated to attain the formation of a high percentage of condensables upon functioning to result in low residual internal cartridge pressure. In FY 80, self-contained cartridge and propellant designs will be optimized and the design feasibility testing program conducted.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

1.0012, THEORETICAL INVESTIGATION OF HIGH-LIFT AERODYNAMICS

A.G. Bennett, Mississippi State University, School of Engineering, Dept. of Aerophysics & Aerospace Engineering, *Suite 101 Engineering Bldg., Mississippi State, Mississippi* 39762 (NSG 1623)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0013, PAVEMENT DETERIORATION ANALYSIS

V.C. Barber, U.S. Dept. of Defense, Army, Corps of Engineers, Waterways Experiment Station, *P.O. Box 631, Vicksburg, Mississippi* 39180 (DA0T8181)

To develop methodolgy for the analysis of and prediction of functional and structural deterioration and the resultant attrition of serviceability of airfields and roads. To define all pertinent modes of deterioration, their respective mechanisms and rates and influence upon pavement system deterioration. To develop methodology for incorporation of these developments into

design, maintenance, and evaluation procedures in a manner to provide for pavement life-cycle management.

This effort is structured on a five-year basis with intermediate milestones. The approach for the remaining years consists of collecting data for validation of the deterioration analysis and reliability analysis procedures developed during FY 77. The deterioration and reliability analysis procedures developed will be published during FY 78 in the first-generation form and validated versions will be published as they become available. The work herein is applicable to all pavement types and is contingent upon the availability of data.

SUPPORTED BY U.S. Dept. of Defense, Corps of Engineers, Waterways Experiment Station

1.0014, INVESTIGATION OF SOLID STATE DEPOSITION TECHNOLOGY APPLIED TO AERODYNAMIC INSTRUMENTATION

W.C. Rose, University of Nevada, Reno Campus, Graduate School, *Reno, Nevada* 89507 (NSG 2395)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0015, ANALYSIS & MODELING OF AIR TRAFFIC CONTROL SYSTEM PERFORMANCE MEASURES

Unknown, Princeton University, Graduate School, *205 Nassau Hall, Princeton, New Jersey* 08540 (FA78NA-5060; FA161451 (TRAIS NO.))

This contract addresses the statistical analysis and modeling of air traffic control (ATC) system performance measures. Its purpose is to develop analytical solutions and simulation/modeling which will more adequately describe the 'real' physical environment. The models will be both descriptive and predictive. To fulfill the contract, it is necessary that data are collected and analytical routines are developed to ensure that numerical/statistical individual data set is analyzed. At least one of the by-products of this modeling will be the determination of an estimate of collision risk.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

1.0016, PRELIMINARY INVESTIGATION OF THE EXTERNAL FLOW ANALYSIS FOR DENSITY MEASUREMENTS AT HIGH ALTITUDE

G.K. Bienkowski, Princeton University, School of Engineering & Applied Sciences, Dept. of Aerospace & Mechanical Science, *Box 430, Princeton, New Jersey* 08540 (NSG 1630)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0017, FREE STREAM DISTURBANCES, CONTINUUM EIGENFUNCTIONS, BOUNDARY LAYER INSTABILITY AND TRANSITION

H. Salwen, Stevens Inst. of Technology, Graduate School, Dept. of Physics & Engineering Physics, *Castle Point Station, Hoboken, New Jersey* 07030 (NSG 1619)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0018, X-22A TASK - V/STOL FLIGHT RESEARCH PROGRAM

J.L. Beilman, Calspan Corp., Dept. of Aerodynamic Research, *1422 Genesee Ave., P.O. Box 235, Buffalo, New York* 14221 (DN881490; N62269-78-C-0043)

To flight-validate emerging new V/STOL flying qualities criteria with emphasis on the hover low speed and transition flight characteristics. This contract supports work unit ZA601, Agency Accession No. DN6810809.

This is a 2-year program divided into four subtasks each of which deals with a high priority segment of V/STOL flying qualities. Subtask A addresses hover low speed translational rate control flying qualities criteria in VFR flight. Flight experiments will be performed with turbulence control power and equivalent system form as elements of the experiment matrix. Pilot opinion ratings will be obtained, results analyzed and a final technical report issued. Remaining subtasks will be defined pending results of subtask A.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0019, INVESTIGATION OF PASSIVE SHOCK WAVE-BOUNDARY LAYER CONTROL FOR TRANSONIC AIRFOIL DRAG REDUCTION

H.T. Nagamatsu, Rensselaer Polytechnic Inst., School of Engineering, Dept. of Mechanical Engin Aeronautical Engin & Mechanics, *110 8th St., Troy, New York* 12181 (NSG 1624)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0020, VISCOUS INTERACTION EFFECTS ON AIRFOIL PERFORMANCES

O.R. Burggraf, Ohio State University, Columbus Campus, School of Engineering, Dept. of Aeronautical & Astronautical Engineering, *190 N. Oval Dr., Columbus, Ohio* 43210 (NSG 1622)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0021, AIRCRAFT/WEAPON SYSTEM OPTIMIZATION

R.D. Dyer, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF140170)

Air-to-ground attack aircraft can experience severe degradation of performance when carrying weapons externally. Internal carriage results in volumetric penalties to the aircraft and presents a difficult design problem for the weapons bay, bay doors and for weapon separation at supersonic speeds. Advanced forms of weapons carriage such as tangent/conformal mount minmize the adverse effects of external carriage and also show promise for providing a better launch environment. The objective of this effort is to develop prediction techniques and design criteria for external and internal carriage of weapons on current and future tactical aircraft to minimize the clean aircraft performance degradation and to reduce operating costs through fuel savings.

Experimental program will be initiated to acquire basic data on aircraft/store compatibility. These data will include aeroacoustic data in weapon bay cavities with and without suppression devices and isolated store force data. The aircraft/external store interference prediction technique generated under contract F33615-73-C-3018 will be computerized and evaluated using available experimental data. Technical problems lie in the complex interference flow conditions in the transonic speed range which force reliance on experimental data as the basis for prediction of method development.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0022, NAVIGATION/FLIGHT CONTROL INTERFACE

J.A. Kocher, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF134830)

The Air Force function for this effort is to examine tradeoffs between pilot workload and tracking performance for flight paths of varying complexity, and recommend techniques for reducing pilot workload. With the impending imposition of area navigation upon the civil and military fleet, no definition has been given to the control techniques and accuracy requirements to comply with future National Airspace System (NAS) criteria. The objective of this effort is to document pilot workload difficulties associated with real-time flight path modifications and develop new methods for trajectory management. This development will provide the Air Force with information contributing to precise spatial control of military flight vehicles while maintaining NAS compatibility.

A commercial area navigation system is installed in a C-135 test aircraft. Hardware and software modifications to the basic system will be performed under contract. A flight test study will

be conducted to measure path tracking performance for several flight test profiles of varying complexity. A set of recommendations will be generated to indicate areas of possible pilot workload savings and performance improvements.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0023, AIRCRAFT LINEAR AND ANGULAR VIBRATION PREDICTION

M.W. Obal, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF136760)

Due to the inadequacy of present prediction techniques for aircraft vibration environments, many complex and expensive avionics and weapons systems are unreliable or overdesigned. The performance of electro-optical and inertial sensing systems is dependent on angular as well as linear vibration, but very little is known about this environment. Present vibration prediction methods will be improved with an empirical prediction technique for the vibration induced by the noise environment of fighter aircraft and the vibration transmission paths to internal equipment mounting locations. A compendium of angular vibration data from flight tests on fighter, transport, and bomber aircraft will be produced, and this data used to formulate an empirical prediction technique for angular vibration.

This effort will be approached in two phases. First, external acoustic excitation will be correlated with acceleration response at equipment mounting locations in an RF-4C at several flight conditions. Statistical regression analysis will be conducted on the flight test data to relate responses and excitations, and confidence intervals about the regression lines will be established. Concurrently, angular vibration measurements will be made on the RF-4C and other types of aircraft to provide a compendium of angular vibration data. Since angular vibration transducers for these measurements are not readily available, the second phase will begin with a comprehensive investigation into angular transducers and their calibration techniques. An empirical prediction technique will be developed from the flight data with special emphasis on relating angular and linear vibration.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0024, DEVELOP NEW TECHNOLOGY CONCEPTS FOR AERODYNAMIC GROUND TESTING

D.M. Pavobek, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF141810)

In the development of advanced tactical and V/STOL fighters, transonic transports, experimental hypersonic cruise aircraft, as well as other hypersonic strategic weapons systems, subsonic and transonic aerodynamic characteristics are particularly problematic and must be studied extensively in a quality test flow. The Aeromechanics Division has no such in-house facility to carry out this mission because of conversion to space-oriented facilities in the early 1960's. The objective of this effort is to develop new concepts for aerodynamic ground testing up through the transonic regime and also the hypersonic regime, to more effectively impact development of current and future weapons systems.

Analytical and prototype experimental studies will be performed for an advanced transonic test section design for a new gas-dynamic facility. Advanced capabilities and test concepts for high energy flow test facilities will be studied.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0025, CLOSED ENVIRONMENTAL CONTROL SYSTEM EVALUATION

R.W. Watts, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF141540)

Future high performance military aircraft will encounter severe mission penalties if conventional approaches to the environmental control system (ECS) are used. Reduction of significant mission take-off-gross-weight (TOGW) penalties is possible through development of a closed-loop ECS. This ECS concept can reduce engine bleed air and ram air penalties by approximately 80 percent. Additional reliability and cost savings are attainable through new designs. The objective of this effort is to develop criteria for the most important elements of the closed-loop ECS (the air cycle machine (ACM), drive system, expansion devices).

Test those elements of a closed-loop ECS that are needed to improve the life cycle cost of advanced aircraft. These elements would include the Rovac models 607 and 608 ACM, a closed-loop hydraulic drive, and various expansion and refrigeration machines which will exhance closed-loop ECS performance. Initiate analysis programs to determine the stability and control characteristics of various closed-loop ECS configurations. For example, a model shall be constructed on the 'easy' dynamics program to study closed-loop arrangements under dynamic inputs.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0026, AERODYNAMIC PREDICTIONS FOR ANALYSIS AND DESIGN

T.M. Weeks, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF131990)

Aerodynamic prediction methods for analysis and design are required throughout the subsonic, transonic, and supersonic speed range of advanced technology military aircraft. The objective is to obtain for in-house use both quick turn-around programs (level 1) and more comprehensive programs providing much greater accuracy (level 2). Computer programs for handling arbitrary configurations will be obtained and appropriate theoretical and experimental investigations will insure their validity. These programs are necessary to prevent technological deficiencies and reduce development cost.

Existing level 1 programs will be extended to handle advanced technology concepts. Capabilities of current level 2 programs will be identified, obtained/extended where possible and new programs developed. Analytical efforts and experimental investigations will provide validation of key features of computer programs.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0027, FINITE ELEMENTS FOR ROTOR/STATOR INTERACTIVE FORCES IN GENERAL ENGINE DYNAMIC SIMULATOR

M.L. Adams, University of Akron, School of Engineering, Dept. of Mechanical Engineering, *302 E. Buchtel Ave., Akron, Ohio* 44304 (NSG 3283)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

1.0028, STUDY OF BOUNDARY LAYER TRANSITION USING TRANSONIC-CONE PRESTON-TUBE DATA

P.M. Moretti, Oklahoma State University, Graduate School, Dept. of Mechanical/Aerospace Engineering, *211-215 Whitehurst Hall, Stillwater, Oklahoma 74075* (NSG 2396)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0029, COCKPIT MOTION SYSTEM TESTING

C. Negron, ARC Corp., *1300 Industrial Hwy., Southampton, Pennsylvania* 18966 (DN994020; N61339-79-C-0020)

Provide goods and software services necessary to satisfy the requirements of project 9732, motion system testing. Support includes software assembly and testing software, and field testing on operational system.

Develop testing plan, write software for plan, determine computer sizing requirements, test software, systems integration, local testing, field testing.

SUPPORTED BY U.S. Dept. of Defense, Naval Training Equipment Center, Human Factors Lab.

1.0030, DEMONSTRATION OF ADVANCED CARGO RESTRAINT HARDWARE FOR COD AIRCRAFT
J. Shefrin, Boeing Co., *P.O. Box 16858, Philadelphia, Pennsylvania* 19142 (DN881347; N62269-77-C-0429)

This effort is intended to demonstrate advanced cargo restraint hardware components and the integrated restraint of a unit of cargo. The demonstration hardware and dynamic testing is part of a program of hardware/system concept assessment for Navy COD and VOD type aircraft. The objectives of an advanced cargo restraint system for COD aircraft include reduced turnaround time (for cargo handling, tiedown, release, reconfiguration) and minimum cost. Energy management design technology will be applied to enhance system integrity and crew/passenger survivability under aircraft crash conditions. Supports work unit ZA601, DN681080.

Demonstration restraint hardware will be provided for installation and dynamic testing at a horizontal accelerator facility. The effort will include analysis, design, and fabrication of adjustable restraint tension members and load limiters, and supply of tiedown hardware for restraint of a unit of cargo. An installation and test plan will be provided. Hardware installation and testing will be accomplished in accordance with the approved installation/test plan under the direction of the contractor.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0031, THE BOUNDARY LAYER ON COMPRESSOR CASCADE BLADES
I. Kubo, Pennsylvania State University, University Park Campus, Graduate School, *205 Kern Graduate Bldg., University Park, Pennsylvania* 16802 (NSG 3264)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

1.0032, ANALYTICAL AND NUMERICAL GAS DYNAMICS
L. Sirovich, Brown University, Undergraduate School, Dept. of Applied Mathematics, *University Hall, Box 1883, Providence, Rhode Island* 02912 (NSG 1617)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0033, INTERNAL COMPUTATIONAL FLUID MECHANICS PROGRAM FOR TURBOMACHINERY
M. Kurosaka, University of Tennessee, Knoxville Campus, Graduate School, *W. Cumberland Ave. S.W., Knoxville, Tennessee* 37916 (NSG 3287)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

1.0034, HT RM 78-28 - ANALYSIS OF HIGH-FREQUENCY VIBRATION DATA
R. Hunthausen, U.S. Dept. of Defense, Army, Aviation Research & Development Command, Applied Technology Lab., *Fort Eustis, Newport News, Virginia* 23604 (DA0E3815)

To investigate the feasibility of using high-frequency vibration data to diagnose the condition of helicopter drive train components.

Using vibration data acquired on known discrepant parts during the AIDAPS program, apply latest and most advanced techniques of analysis and attempt to establish correlation between the analysis results and the known part condition.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Research & Technology Lab.

1.0035, HT RM 78-22 - ANALYSIS OF INCREMENTAL CHANGES IN USEFUL LOADS
Unknown, U.S. Dept. of Defense, Army, Aviation Research & Development Command, Applied Technology Lab., *Fort Eustis, Newport News, Virginia* 23604 (DA0E3829)

After an aircraft is in the Army inventory, minor changes are made which alter the useful load of the aircraft. Such changes affect the ability of the aircraft to meet its mission, so the cost of additional resources necessary to accomplish a given task must be assessed. The objective of this program is to develop a technique to use when analyzing the cost, in terms of meeting a constant objective, of incremental reduction in useful load in fielded aircraft.

The technical objective will be accomplished in seven steps: (1) literature search; (2) definition of parameters to be studied; (3) development of analysis technique (measures of worth); (4) data definition and collection plan (r and m cost); (5) definition of aircraft operating environment; (6) detailed analysis of aircraft operating characteristics; and (7) preliminary example study.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Research & Technology Lab.

1.0036, LIGHTPLANE HANDLING QUALITIES STUDY AND FLIGHT TESTS
R. Shade, U.S. National Aeronautics & Space Admin., Office of Aeronautics & Space Technology, Langley Research Center, *Hampton, Virginia* 23665 (FA77WAI-797; FA161236 (TRAIS NO.))

Equipment loan and transfer of accountability from the FAA to the NASA Langley Research Center, during the lightplane handling qualities study and flight tests being conducted at and by Princeton University under NASA contract.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

ASTRONAUTICS

Includes Astronautics (general); Astrodynamics; Ground Support Systems and Facilities (space); Launch Vehicles and Space Vehicles; Space Transportation; Spacecraft Communications; Command and Tracking; Spacecraft Design, Testing, and Performance; Spacecraft Instrumentation; and Spacecraft Propulsion and Power. For Related Information See Also Aeronautics.

2.0001, PIONEER VENUS DATA ANALYSIS
M.B. McElroy, Harvard University, Cambridge Campus, School of Arts & Sciences, Dept. of Astronomy, *Cambridge Station, Cambridge, Massachusetts* 02138 (NAS 2-10249)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

2.0002, TECHNOLOGY SUPPORT FOR TARGETING THE REENTRY OF SKYLAB
Unknown, Pennsylvania State University, University Park Campus, Graduate School, *205 Kern Graduate Bldg., University Park, Pennsylvania* 16802 (NASW 3256)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Headquarters

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, HOMOGENEOUS AND HETEROGENEOUS TERNARY COMPLEXES INVOLVING NUCLEOTIDES, METAL CATIONS AND AMINO ACIDS
J. Orenberg, California State University & Colleges, San Francisco State University, School of Science, Dept. of Chemistry, *1600 Holloway Ave., San Francisco, California* 94132 (NCA2-660902)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

3.0002, INVESTIGATION OF CONTROLLED NUCLEATION THERMOCHEMICAL DEPOSITION (CNTD) MECHANISM AND PROPERTIES

R.A. Holzl, Chemetel Corp., *Pacoima, California* 91331 (DF047780; F49620-77-C-0086)

AF function - ceramic materials are being developed for a variety of components (e.g. blades, vanes, combustors, bearings and seals) in future gas turbine engines and for a variety of electronic and optical components in aircraft. Opportunity - a new CVD-like process known as CNTD (controlled nucleation thermochemical deposition) has been developed for producing very fine-grained materials having superior mechanical properties. Objective - the objective of this research is to study the mechanism and deposition parameters of CNTD for fine-grained high-strength silicon carbides. How work contributes - silicon carbide and silicon nitride filaments, films and monolithic shapes are needed for rocket nozzles, turbine components, and radome applications. Silicon carbide was selected for the initial studies in order to utilize the extensive experience in conventional vapor deposition of SiC.

The optimum deposition parameters for CNTD will be established to produce fine-grain, high-strength SiC. Microstructure and mechanical testing data will be used in an iterative development cycle for optimizing the process.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0003, A KINETICS STUDY OF THE REACTION OF METHYLPEROXY RADICALS WITH NITROGEN DIOXIDE

Unknown, Georgia Tech Research Inst., *Atlanta, Georgia* 30332 (FA78WA-4259; FA161585 (TRAIS NO.))

This study is to measure by direct observation of reactants and/or products over the relevant range of tropospheric temperature and pressure the absolute reaction rate of peroxy methyl radicals (CH_3O_2) with nitrogen dioxide (NO_2).

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

3.0004, FLOW LEADING TO FRACTURE

P.P. Gillis, University of Kentucky, School of Engineering, Dept. of Metallurgical Engineering, *Limestone & Euclid, Lexington, Kentucky* 40506 (DF049330; AFOSR-77-3379)

AF function - improved quality of aerospace vehicle structures can lead to enhanced durability. Deficiency - the basic understanding of the mechanics of metal deformation during procesing does not exist to the degree which can lead to improved quality of structures. Objective - the objective of the research is to understand the stress and deformation states of a metallic material as it is processed and the relationship of these states to fracture. How work contributes - this research contributes to the basic understanding of metal deformation processes which can affect AF manufacturing technology efforts.

Based on a material constitutive law which considers both the hardening and strain rate effects, a theory is being investigated which will predict the regions of material flow (yielding) and the kinematic boundaries. This theory was applied to one-dimensional problems during the past year. Extension of this theory to two dimensions will be the central focus of the present research. Also, material phase transformations will be studied for possible modifications to the basic constitutive behavior.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0005, MATERIALS SUPPORT TECHNOLOGY - ADVANCED ALUMINUM ALLOYS BASED ON RAPIDLY-SOLIDIFIED POWDERS

N.J. Grant, Massachusetts Inst. of Technology, School of Engineering, Dept. of Materials Science & Engineering, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (DN875330; N00014-78-C-0385)

This research addresses a possible method for producing high specific strength aluminum alloys for use in advanced Navy systems. Such alloys are needed for missile, aircraft and surface ship components where fatigue and/or creep are major design considerations.

The investigators will prepare rapidly-solidified powders by the roll-quenching and ultrasonic atomization techniques. The aluminum-lithium alloy system will be emphasized with controlled additions of Cd, Cr, Be and Mn. Powders will be canned, extruded and then various heat treatments applied to optimize properties. Structure will be determined by transmission and scanning electron microscopy. Mechanical properties of interest to be measured include tensile properties, fatigue, toughness and creep rupture resistance.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0006, CREEP AND FATIGUE OF AIRCRAFT ENGINE ALLOYS

F.S. Hodi, U.S. Dept. of Defense, Army, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center, *Watertown, Massachusetts* 02172 (DA0F4741)

To investigate the degradation of mechanical properties of aircraft engine alloys as a function of temperature and time. Specifically the interaction of creep and fatigue in titanium alloys will be studied.

Testing to study the creep-fatigue interaction of an alpha alloy will continue. These results will assist in determining an acceptable design standard to incorporate both phenomena at temperatures 700-900 degrees F. Strain-controlled fatigue tests will be conducted at high frequency so that creep will be excluded from the deformation. To simulate gas bending forces, rotating beam equipment has been adapted for elevated temperature testing.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center

3.0007, ALTERNATE FUELS NITROGEN CHEMISTRY

J.W. Frankenfeld, Exxon Research & Engineering Co., Government Research Labs, *1600 Linden Ave., Linden, New Jersey* 07036 (DN890054; N00019-78-C-0177)

The objective of the program is to find the effect of the presence of nitrogen compounds in shale-derived alternate jet fuels on the storage stability of the fuel.

Deposit formation will be studied as a function of pyrrole, indole and carbazole compounds in n-decane. Effects of trace materials which inhibit sedimentation will be studied. The kinetics and mechanisms of formation of deposits will be studied and the structures characterized.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

3.0008, THEORETICAL DETERMINATION OF STRUCTURES, BENDING ENERGIES AND VIBRATIONAL FREQUENCIES

A.B. Anderson, Case Western Reserve University, Graduate School, *2040 Adelbert Rd., Cleveland, Ohio* 44106 (NSG 5392)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

3.0009, OPTICAL STUDIES OF LUBRICATION AND TRANSFER FILMS FOR PROSTHETIC DEVICES

B.D. Cahan, Case Western Reserve University, School of Science, Dept. of Chemistry, *2165 Adelbert Rd., Cleveland, Ohio* 44106 (NSG 3288)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

3.0010, NON-DESTRUCTIVE TEST TECHNIQUE

A. Mahon, Qual X Inc., *4065 N. Leap Rd., Hilliard, Ohio* 43026 (DN789758; N00019-76-C-1142)

To KET inspect engine hardware and test materials supplied by the Naval Air Propulsion Test Center and the Naval Air Systems Command (Air-330A).

To develop KET standards and specifications and trouble shoot service problems. Apply KET to key components.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Propulsion Test Center

3.0011, A STUDY OF OPTIMAL ELECTRODE PREPARATION FOR THE ELECTROCHEMICAL CONCENTRATION CELL OZONESONDE

D.C. Thornton, Drexel University, School of Science, Dept. of Chemistry, *32nd & Chestnut Sts., Philadelphia, Pennsylvania* 19104 (NSG 6035)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Wallops Flight Center

3.0012, THE LONG WAVELENGTH INFRARED ABSORPTION BY SO2 AND ITS IMPORTANCE IN FORMING VENUS' GREENHOUSE

R.W. Lovejoy, Lehigh University, Graduate School, Dept. of Chemistry, *Alumni Memorial Bldg., Bethlehem, Pennsylvania* 18015 (NCA 2-380901)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

3.0013, NAVY VEHICLE DESIGN AND CONSTRUCTION - FRACTURE OF METALS AND ALLOYS

H.G. Wilsdorf, University of Virginia, School of Engineering & Applied Science, Dept. of Materials Science, *Garrett Hall, Charlottesville, Virginia* 22903 (DN023110; N00014-75-C-0855)

The goal of this research is to gain a better understanding of crack propagation and fracture processes occurring in metals and alloys. This knowledge will be useful in the development of reliable, crack-resistant alloys needed in advanced naval systems such as high performance aircraft and deep diving submarines.

Crack propagation and fracture of various metals and alloys is being observed directly in a 500kV electron microscope. This allows dislocation interactions and fracture processes to be observed on a near atomic scale in specimens which exhibit bulk rather than thin film behavior. Correlation of experimental observations with theoretical fracture analyses is being undertaken.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0014, CALCULATION AND ASSESSMENT OF INTERLAMINAR STRESSES IN LAYERED COMPOSITE MATERIALS

N.J. Salamon, University of Wisconsin, Milwaukee Campus, School of Engineering & Applied Science, Dept. of Mechanics, *Pearse Hall, Room 107, Milwaukee, Wisconsin* 53201 (DF053310; AFOSR-78-3680)

AF function - advanced lightweight flight vehicles will use composite materials to improve their structural efficiency. Deficiency - the interlaminar failure mode of composite laminates is not predictable within the desired confidence level. Objective - to develop improved methods for the prediction of interlaminar stresses in laminates and the associated failure strength. How work contributes -research results will aide in fully understanding the failure of complex laminates.

Initial studies will focus on the analytical and numerical methods which can be used to predict the singular stress behavior. Both solution accuracy and efficiency will be considered in assessing the feasibility of the solution methods. In addition, an experimental investigation will be conducted in order to achieve verification of the predicted behavior. Both damage initiation and growth will be studied in the laboratory.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0015, TRANSPORT AND RECOMBINATION PROPERTIES OF LEAD TIN TELLURIDE ALLOYS

K. Weiser, Technion, *Haifa, Israel* (DF050450; AFOSR-78-3509)

AF function - secure space communications and cover optical electronics require devices which exploit special properties and interactions of materials with FAR infrared radiation. Opportunity -infrared materials research has a high potential impact on novel detectors, sources and communications for airborne and spaceborne applications. Objective - this research involves the film growth of lead tin telluride alloy compositions, and characterization and study of fundamental optical properties and electronic structure of these IV-VI compound semiconductors when subjected to tunable CO2 laser pulses. How work contributes - the IV-VI semiconducting compounds are potentially useful as infrared detectors in the 8 to 14 micrometer and 20 to 30 micrometer ranges of the electromagnetic spectrum. The shorter wavelength interval is the primary spectral region for thermal imagery of terrain and ambient temperature objects, whereas the longer interval is of interest for detecting objects against cold-space backgrounds.

Large single crystal films are produced by unique epitaxial vapor phase techniques. The size, thickness and stoichiometry are more easily controlled and tailored to produce homojunctions, heterojunctions of the same or opposite carrier type, graded energy gap junctions or Schottky barriers without resorting to diffusion processes.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, AERO DESIGN, SIMULATION AND DATA INVESTIGATION OF DEMO ROCKET

J.W. Wallace, U.S. Dept. of Defense, Army, Missile Research & Development Command, Aeroballistics Directorate, *Redstone Arsenal, Huntsville, Alabama* 35809 (DA0G1014)

To improve the accuracy and reduce the cost of surface-to-surface free flight rockets through aerodynamic techniques.

The aerodynamic configuration design will be established for the demonstration low cost motor vehicle. Work will include wind tunnel tests, final configuration, and related aerodynamic coefficients. Simulations will be conducted using existing rigid body six-degree-of-freedom trajectory digital simulation programs which will be modified to include particulars of the demonstration rocket. Flight data investigations support will be provided to the free flight rocket technology program for the determination of aerodynamic coefficients and exterior ballistic performance.

SUPPORTED BY U.S. Dept. of Defense, Missile Research & Development Command, Free Flight Rocket Technical Office

4.0002, PROPAGATION OF SHOCK WAVES IN RANDOM MEDIA

B. Sturtevant, California Inst. of Technology, Graduate School, Dept. of Aeronautics, *1201 E. California Blvd., Pasadena, California* 91109 (ENG7822089)

Experimental studies will be conducted on the interactions between shock waves and random media. Attention will be directed on the effects of turbulence on shock wave propagation, including scattering and random focusing, and on the effect of shock wave compression on random media, such as vorticity generation, enhanced mixing and subsequent turbulent decay. New optical diagnostic techniques will be developed and information about the propagation of laser light through random media will be obtained as a bonus.

In the long run the results of this research could contribute to, for example, increased understanding of combustion instability and burning rate in burners; the achievement of higher energy release and increased efficiency in high-energy chemical and gasdynamic lasers; better understanding of transonic shock-boundary-layer interactions, wave drag and boundary-layer separation; and to improve methods for laser transmission.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0003, DELAY OF SEPARATION WITH FREE STREAM TURBULENCE

J.A. Hoffmann, California State University & Colleges, California Polytechnic State University, School of Engineering & Technology, Dept. of Aeronautical Engineering, *San Luis Obispo, California* 93407 (NSG 2391)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

4.0004, THREE-DIMENSIONAL UNSTEADY FLOW THEORY

S.S. Stahara, Nielsen Engineering & Research Inc., *850 Maude Ave., Mountain View, California* 94040 (DN323079; N00014-73-C-0379)

The prediction of aircraft performance during rapid maneuvering, while encountering gusty environments, or to avoid flutter requires a knowledge of unsteady aerodynamic forces. The purpose of this task is to develop an accurate 'analytical' method for calculating the unsteady pressures, forces and moments on broad classes of three-dimensional configurations (wings, slender bodies and wing-body combinations) at transonic speeds.

Though rapid advances have been made in the numerical solution of complex flow fields, the calculation of unsteady aerodynamic flows about three-dimensional configurations by finite difference techniques remains a distant goal because of the computing time involved. In the research under investigation, an analysis of oscillatory motion at transonic speeds will be undertaken. In this analysis it will be assumed that the oscillatory flow is a small perturbation on a basic nonlinear steady flow, which can be obtained theoretically or experimentally. The resultant equation for the oscillatory flow will be solved by the method of local linearization to predict the characteristics of three-dimensional configurations.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0005, THE BEHAVIOR OF SUB-GRID SCALE MOTIONS IN TURBULENT SHEAR FLOW

B. Cantwell, Stanford University, Graduate School, *Stanford, California* 94305 (NSG 2392)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

4.0006, DEVELOPMENT OF TUNABLE LASER ABSORPTION SPECTROSCOPY AND APPLICATIONS TO HIGH TEMPERATURE STUDIES OF NO-NH3 KINETICS

R.K. Hanson, Stanford University, School of Engineering, Dept. of Mechanical Engineering, *Stanford, California* 94305 (ENG7826158)

Research is conducted in four areas related to diagnostics and high-temperature chemical kinetics for combustion. They are: 1. Tunable Diode Laser: Modify optical/electronic arrangement of existing tunable diode laser system for the measurement of minority species. Select wavelengths and optimize system for measurement of nitrogen monoxide and nitrogen oxide. 2. Tunable Dye Laser: Develop dye laser system for tunable laser absorption spectroscopy of specific radical species. Optimize for fixed-wavelength probing of shock-heated flows and for high-resolution modulation spectroscopy of flat flame experiments. 3. Shock Tube Studies of Nitrogen Oxide-Ammonia Kinetics: Conduct shock tube experiments in specific gas mixtures at temperatures of about 1500-3000 degrees K. Analyze data to define a consistent kinetic mechanism and determine rate constants. 4. Flat Flame Studies of Nitrogen Oxide-Ammonia: Modify existing flat flame facility for postflame injection of diluted ammonia. Measure nitrogen oxide and ammonia by microprobe and chemiluminescent analysis, nitrogen oxide and nitrogen monoxide by tunable infrared laser absorption, and other components by tunable ultraviolet/visible laser absorption. Analyze data for mechanism constants with shock tube experiments and determine relevant rate constants.

The research is a continuation in part of research done under NSF Grant ENG76-08279.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0007, NAVY VEHICLE DESIGN AND CONSTRUCTION - FREQUENCY DOMAIN TECHNIQUES FOR DIRECT SYNTHESIS OF DIGITAL CONTROL SYSTEM

R. Whitbeck, Systems Technology Inc., *13766 S. Hawthorne Blvd., Hawthorne, California* 90250 (DN875390; N00014-78-C-0391)

The objective of this research effort is to develop a closed-loop solution for direct digital control of continuous plants which is optimal with respect to a continuous cost function. Present control theory does not treat this case. This solution is needed to evolve efficient and successful synthesis of digital control laws for future Navy aircraft and missile flight control systems.

The approach being pursued is to use modern matrix Wiener-Hopf frequency domain techniques to develop an optimal closed-loop solution for direct digital control of continuous plants using a continuous cost function. Indications are that the optimal solution via the Wiener-Hopf approach will specify both the control law and the optimal form of the digital to analog coupler.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0008, PRECISION BURN-RATE DETERMINATION (PBR)

B.B. Goshgarian, U.S. Dept. of Defense, Air Force, Rocket Propulsion Lab., *Edwards A.F.B., California* 93523 (DF348370)

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rocket Propulsion Lab.

4.0009, THREE-INCH DIMENSIONAL BISPECTRA AND THE MEAN RATE OF TRANSFER OF ENERGY IN TURBULENCE

M. Rosenblatt, University of California, San Diego Campus, Graduate School, Dept. of Mathematics, *P.O. Box 109, La Jolla, California* 92037 (NSG 2376)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

4.0010, STUDIES OF OPTICAL-BEAM PHASE-CONJUGATION BY NONLINEAR REFRACTION

R.W. Hellwarth, University of Southern California, School of Engineering, Dept. of Electrical Engineering, *3551 University Ave., Los Angeles, California* 90007 (DF051200; AFOSR-78-3479)

AF function - the University of Southern California has proposed a concept that could have tremendous impact on adaptive optics approaches to Air Force laser systems. These currently involve scanning detectors, interferometers, computers, servosystems and deformable mirrors. All of this hardware could be replaced by a nonlinear element at low power if the nonlinear refractive idea succeeds. Opportunity - nonlinear refraction may be able to generate an output optical beam which has conjugate phase from that of the input beam and the same frequency as the input beam. The important point is that if a laser beam is propagated through an atmosphere and reflected back to the receiver, then it will be subjected to an aberration by the optical path that it traversed. If this aberrated return is used as the signal into the nonlinear refractor the refracted signal would be the phase conjugate of the aberration. This could be injected into a high power laser and phase locked so that the laser generates a beam at high power with conjugate phase of the aberrations in the optical path. Objective - to demonstrate 'proof-of-principle' in the visible using existing nonlinear materials. Contributions - the work provides an alternative to the adaptive optics approach to correcting distortions.

Efforts will be made to reduce pump power requirements from megawatts to kilowatts by both exploring resonant enhancement of the nonlinear index and modifications of beam interaction geometry. It is proposed that a narrow-band dye laser, to be pumped by a repetitive pulsed nitrogen laser, will be built and

tuned near the resonances of various atomic vapors. They will build cells appropriate for containing sodium, rubidium, and potassium vapors as these appear to be the most promising media for experimentation in the visible.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0011, STUDY OF THE GLOBAL POSITIONING SYSTEM FOR MARITIM CONCEPTS
B.W. Parkenson, Colorado State University, Graduate School, *Fort Collins, Colorado* 80523 (NSG 5352)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

4.0012, DELTA-K RADAR DEVELOPMENT PROGRAM
D.L. Schuler, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN480008)

The purpose of this research project is to determine the effectiveness of a coherent dual frequency correlation radar for achieving (a) improved target detection, (b) target classification, and (c) remote sensing of ocean waves and surface currents.

The Delta-K Radar transmits two closely-spaced RF frequencies and, upon reception, cross-correlates the coherently-detected backscattered EM fields to achieve improved detection and classification for both fixed- and moving-ship targets. Target classification is possible because the swept-frequency output of the radar contains target resonances which are similar to those obtained with an hf radar. These characteristic resonances are not overly aspect-angle-dependent and temporal scintillations occur at much lower rates than might be expected for a conventional 1-band system.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

4.0013, DELTA-K RADAR DEVELOPMENT PROGRAM
D.L. Schuler, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN480224)

The purpose of this research project is to determine the effectiveness of a coherent dual-frequency correlation radar for achieving (a) target classification, and (b) remote sensing of ocean waves and surface currents.

The Delta-K Radar transmits two closely-spaced RF frequencies and, upon reception, cross-correlates the coherently-detected backscattered EM fields to achieve an output which has many of the characteristics of HF return from ships and the sea. Target classification is implemented through swept-frequency measurement of target resonances which occur at the difference frequency. These resonances fluctuate less, and are much less aspect-angle-sensitive than similar resonances obtained using the 1-band carrier itself. Sea spectra and ocean surface currents are remotely sensed by measuring the position and amplitude of the Bragg resonant Doppler line which is present in the spectrum of returns from the sea surface.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0014, COMMUNICATIONS - ATOMIC CROSS-SECTIONS AND HIGH-FREQUENCY COMMUNICATIONS
T.L. Bailey, State University System of Florida, University of Florida, School of Engineering, Dept. of Electrical Engineering, *220 Black Hall, Gainesville, Florida* 32611 (DN623260; N00014-76-C-0127)

The purpose is to study ion-neutral collisions including multiple charge exchange at low energies and determine the cross-sections for these processes. These are of interest to naval communications since these processes occur in various gaseous electronic devices and the ionosphere.

The contractor will evaluate his new high-energy and angle resolution scattering chamber by studying excitation of Ne, Ar, and Xe by protons. He will then determine high resolution differential cross-sections for He(2plus), Ne(2plus), and Ar(2plus) in various gases. Total cross-section for He(2plus), Ne(2plus), CO(2plus), and Ar(2plus) with various atomic a molecular targets will also be determined.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0015, MODULAR THEORY OF INVERSE SYSTEMS
M.K. Sain, University of Notre Dame, School of Engineering, Dept. of Electrical Engineering, *Notre Dame, Indiana* 46556 (NSG 2388)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

4.0016, STRUCTURAL DAMAGE DUE TO HYDRODYNAMIC RAM
K. Kimsey, U.S. Dept. of Defense, Army, Armament Research & Development Command, Ballistic Research Lab., *Aberdeen Proving Ground, Maryland* 21005 (DA0N4441)

The objective of this task is to develop analytical methodologies to predict the structural damage inflicted on in-flight maneuvering aircraft by blast and fragments. The methodologies would be developed for ultimate use as tools for vulnerability assessment and hardening redesign.

Hydrocode solutions will provide tank wall loadings for a K.E. projectile penetrating a water-filled cylinder. These pressure distributions will be employed in structural response and wave propagation programs to quantify the detrimental effects of hydrodynamic RAM and assess the energy-absorbing capacity of candidate RAM mitigators.

SUPPORTED BY U.S. Dept. of Defense, Armament Research & Development Command, Ballistic Research Lab.

4.0017, DYNAMIC BALLISTIC TESTING-FLIGHT DYNAMICS AND BALLISTIC TECHNOLOGY
L.C. MacAllister, U.S. Dept. of Defense, Army, Armament Research & Development Command, Ballistic Research Lab., *Aberdeen Proving Ground, Maryland* 21005 (DA0A4562)

This project includes ballistic range instrumentation and data analysis improvement and full range projectile dynamics. These applied research programs in the fields of aerodynamics and flight mechanics contribute to the design of, evaluation of, and data base for artillery shell, small arms, missiles and rockets. Tasks covered are the design and test of a projectile with the non-conical boat-tail concept in full-scale artillery calibers including usual real features such as rotating band and fuzing details, the design and procurement of improved optics for range shadowgraphic instrumentation and improved time-based investigations characterizing launch yaw for artillery shell-weapon combinations.

Range and data analysis improvements are pursued by monitoring new developments and implementing applicable ones as well as in-house development. Flight test programs are conducted at the BRL and at other test facilities, and the results analyzed to support the projectile dynamics and non-conical boat-tail objectives.

SUPPORTED BY U.S. Dept. of Defense, Armament Research & Development Command, Ballistic Research Lab.

4.0018, STRUCTURAL MODEL EVALUATION
J.M. Santiago, U.S. Dept. of Defense, Army, Armament Research & Development Command, Ballistic Research Lab., *Aberdeen Proving Ground, Maryland* 21005 (DA0K4494)

A comparison of good quality experimental structural response data for large plastic deformations with BRL-developed computer code results. Decide on the most suitable code to use for the analysis of the blast response of helicopters, aircraft and tank bottoms.

Strain and deflection measurements made on structural elements that are shock-loaded by air and chemically-driven shock tubes will be compared with results produced by codes that are

designed to predict such responses. Edge conditions and types of engineering materials will be varied in order to fully exercise the capabilities of the codes selected for evaluation. The program will focus on the ability of the code to perform in the elasto-plastic to fracture stress region.

SUPPORTED BY U.S. Dept. of Defense, Armament Research & Development Command, Ballistic Research Lab.

4.0019, DEVELOPMENT OF ADVANCED SYSTEM IDENTIFICATION TECHNOLOGY

R.A. Burton, U.S. Dept. of Defense, Navy, Naval Air Test Center, *Patuxent River, Maryland* 20670 (DN793171)

The objective of this research program is to develop more cost-effective flight testing procedures that reduce the cost of flight tests and/or provide for a more comprehensive data analysis.

The technical objective of this program is being achieved through the development of advanced systems identification technology. This includes the development of both state and parameter identification algorithms as well as the proper flight testing procedures. These computer algorithms are based on 'optimal filtering theory' and employ advanced statistical concepts such as the 'likelihood principle' from statistical inference theory. Specifically, the parameter identification algorithms being developed are primarily based on the maximum likelihood principle. The state estimation techniques developed are based on derivatives of Kalman filter technology. Data for verification of the accuracy and utility of these computer programs is obtained through specific flight tests conducted at the Naval Air Test Center. These advanced statistical algorithms are being complemented with the development of classical systems analysis techniques, such as root locus analysis to formulate a total system identification.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0020, REFRACTION/SCINTILLATION

R.K. Crane, Environmental Research & Technology Inc., *696 Virginia Rd., Concord, Massachusetts* 01742 (DF902510; F19628-77-C-0074)

AF radar and communications systems operating at low elevation angles are affected by the refractive index structure of the tropospheric propagation medium. Signal level, signal phase and pointing angles change on time scales ranging from seconds to months. Indications are that short-term fluctuations of one hour or less may exist of such magnitudes as to limit the usefulness of long-range correction models based on surface meteorological data, radiosondes, or radiometric measurements. Available data will be investigated and a future study program will be outlined.

Precision tracking data for orbiting spheres have been generated by the Millstone Radar, which will be analyzed to determine instantaneous refraction errors in pointing, cross-section, and phase versus elevation angle. This data plus scintillation measurements at the Haystack and Millstone sites will aid in the design of a measurement program for the LES 8/9 satellite system.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0021, ENGINEERING SUPPORT ON THE BCAS PROGRAM

Unknown, Massachusetts Inst. of Technology, Lincoln Lab., *244 Wood St., Lexington, Massachusetts* 02173 (FA77WAI-817; FA161203 (TRAIS NO.))

The purpose of this agreement is to provide Lincoln Laboratory engineering support to the FAA, per Article II, on the BCAS program. Analyze the results of air-to-air measurements and link tests and use the analyses to provide guidance to the hardware and sofware design and experimental activities involved in this program. Conduct flight tests using Lincoln Laboratory Airborne Measurements Facility (AMF) in a DABS mode BCAS interrogation and data-gathering mode. Procure 4 DABS general aviation diversity transponders similar to those previously procured for DABS link testing. Add a rugged airborne computer and a modified IVSI display to the AMF to provide a real-time DABS mode BCAS processing capability.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

4.0022, DEVELOPMENT OF A COMPREHENSIVE NDE (NON-DESTRUCTIVE EVALUATION) EXPLORATORY AND ADVANCED RESEARCH PROGRAM FOR NAVAL AIRCRAFT SYSTEMS

R.C. Deitrich, U.S. Dept. of Defense, Navy, Naval Air Engineering Center, *Lakehurst, New Jersey* 08733 (DN696012)

Develop the concepts and follow-on prototype systems to meet future inspection requirements for NDE within the Navy's intermediate and organizational levels of maintenance.

Investigate complexities of various state-of-the-art technologies to develop viable NDE equipment.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0023, PROPULSION RESEARCH COORDINATION AND INDEPENDENT RESEARCH AND DEVELOPMENT (IRAD) ACTIVITY

D.F. Brunda, U.S. Dept. of Defense, Navy, Naval Air Propulsion Test Center, *Trenton, New Jersey* 08628 (DN789759)

To provide technical and management assistance for the Navy's review and evaluation of IRAD effort, and maintain interest with Navy propulsion activity in research (6.1). This work guides contractor-performed IRAD towards the present and future specific needs of the Navy in propulsion, fuels and lubricants and assures that the state-of-the-art is advanced.

NAPC personnel review, evaluate and perform computer analysis of technical plan brochures and participate in contractor on-site reviews, interact with Navy propulsion research activities and industry/university/government research and technical meetings such as combustion institutes, AIAA, ASME and Project SQUID. Consultation and equipment support is provided to the Virginia Polytechnic Institute (VPI) for its gas turbine research facility.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0024, MOM/BMI SOLUTION CAPABILITIES INVESTIGATION

R.J. Balestri, Braddock Dunn & McDonald Corp., *5301 Central Ave. N.E., Albuquerque, New Mexico* 87108 (DF912370; F30602-78-C-0096)

The objective of this effort is to investigate three methods which may extend the range of the electromagnetic spectrum over which the general electromagnetic analysis for complex systems (GEMACS) computer code can be used to analyze the electromagnetic phenomena associated with radiating and scattering systems and subsystems. The three methods include the use of structure symmetry to reduce the size of the matrix equation to be solved, the use of the magnetic field integral equation to model a structure by a set of patches and the use of the geometrical theory of diffraction to treat bodies with surface areas on the order of hundreds of square wavelengths.

The contractor will use existing algorithms and computer codes to implement the methods into the RADC code, GEMACS. The effect of each method on the efficiency of the banded matrix iteration (BMI) solution technique, in GEMACS, will be investigated. If this method does not seriously degrade the efficiency and applicability of the BMI technique, the change to the GEMACS code will become permanent, and the appropriate code documentation will be generated.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0025, MAGNETIC TAPE RECORDING SYSTEMS (FIVE)
J. Bradley, Scientific Recording Systems Inc., *Albuquerque, New Mexico* (DN681278; N62269-75-F-6434)

Fabricate three (3) Mark IIB data acquisition systems. The magnetic tape recording system, model 2311S, is used in the system to record flight loads information. These data are used to update aircraft design criteria. This contract supports work unit ZA101, Agency Accession No. DN681080.

These recording units are production models and have been flight-tested by NADC. The tape outputs are computer compatible. Each unit can record up to 40 channels of data.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

4.0026, DEVELOP A DETAILED PLAN FOR A COMPREHENSIVE FIELD SURVEY ON COMMUNITY RESPONSE TO NOISE
P.N. Borsky, Columbia University, School of Public Health, Dept. of Environmental Health Science, *600 W. 168th St., New York, New York* 10032 (NSG 1616)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

4.0027, AN EVALUATION OF MOSFETS AND METAL SEMICONDUCTOR FET DEVICES AS PREAMPLIFIERS AT LIQUID HELIUM TEMPERATURES (ABBREV)
C.A. Lee, Cornell University, Ithaca Campus, School of Engineering, Dept. of Electrical Engineering, *242 Carpenter Hall, Ithaca, New York* 14853 (NSG 2389)

An evaluation of metal oxide semiconductor field effect transistor and metal semiconductor field effect transistor devices as preamplifiers at liquid helium temperatures.

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

4.0028, FINITE-ELEMENT TECHNIQUES FOR AERODYNAMIC COMPUTATIONS OF COMPLEX CONFIGURATIONS
S.F. Shen, Cornell University, Ithaca Campus, Sibley School of Aerospace & Mechanical Engineering, *Ithaca, New York* 14850 (DN223121; N00014-75-C-0375)

The development of accurate and rapid methods for the prediction of the flows about complex configurations is essential for the design and optimization of naval aircraft and missiles. This task will provide for a systematic study of finite-element methods as applied to such flows.

The computation of the flows about complex configurations in aeronautics now tax, and will continue to tax for the foreseeable future, the capabilities of the most advanced computing machines. Hence there is a continuing need to explore and develop new and more efficient methodologies for complicated flows. The major numerical method to date has centered about finite difference approximations to the governing partial differential equations. Alternate procedures are being developed based on finite-element approximations; approximations which appear to be more practical for complex geometries. These finite-element methods may or may not employ variational principles. This research will systematically examine various aspects of the finite-element method. Initially, inviscid incompressible flow will be studied, utilizing a variational principle, with emphasis on the body geometry. These results will be assessed against exact solutions. The major emphasis will be devoted to a study of inviscid compressible aerodynamic problems including transonic flows.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0029, SUGGESTED PROGRAMS FOR UNSTEADY TURBINE HEAT TRANSFER
R.E. Mayle, Rensselaer Polytechnic Inst., Graduate School, *110 8th, Troy, New York* 12181 (NSG 3262)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0030, CONFORMAL ARRAYS AND HEMISPHERICAL COVERAGE ARRAYS
J. McIlvenna, U.S. Dept. of Defense, Air Force, Rome Air Development Center, *Griffiss Air Force Base, Rome, New York* 13441 (DF903720)

To develop lightweight, inexpensive, flush-mounted and conformal antenna elements and arrays for aerospace use. Designs are specialized to offer enhanced scanning coverage over the full hemisphere.

To design and test elements and arrays in microstrip that provide increased pattern performance in the end-fire directions. To utilize new array geometries, such as the tent redome concept, in low-drag designs, for airborne communication links.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0031, IONOSPHERIC PROPAGATION SIMULATION
G. Sales, U.S. Dept. of Defense, Air Force, Rome Air Development Center, *Griffiss Air Force Base, Rome, New York* 13441 (DF902790)

AF function - long-range detection. Deficiency/opportunity - models for simulating HF propagation in the Arctic (auroral) environment are not sufficient to adequately predict the performance of Air Force systems or provide information for the design of new techniques to improve operational capabilities. Objective - development of new theoretical and numerical models of ionospheric characteristics which influence radio wave propagation and the design of improved ray-tracing techniques. Development of a better understanding of radio propagation through small-scale irregularities in the ionosphere, and improvement of state-of-the-art of radio signal detection in the presence of fading and clutter due to propagation through an inhomogeneous ionosphere. How research contributes - this research is directed at improving the inputs to a realistic model of HF propagation particularly in the auroral region of the ionosphere. These new models in conjunction with fast and accurate ray-tracing will allow assessment of system performance to be made in near real-time and with models of auroral HF clutter allow for both prediction of system performance and improved operational capabilities of existing systems.

New and improved ionospheric modelling techniques will be developed primarily on the basis of analysis of existing radio propagation data. Data which in the past could not be used for this purpose (oblique backscatter data) will be incorporated by the use of newly-developed ray-tracing and computational techniques. Data from experimental OTH radars will be used to develop an auroral clutter model. The new ray-tracing techniques will be developed primarily from theoretical considerations, although full advantage will be taken of improvements in the size and speed of modern digital computers.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0032, X-RAY DIFFRACTION, INTERFERENCE AND HOLOGRAPHY
N. George, University of Rochester, Graduate School, *Administration Bldg., Rochester, New York* 14627 (DF051510; AFOSR-78-3563)

AF function - non-destructive testing of structural members of aerospace vehicles could benefit greatly from the development of three-dimensional x-ray holography. Deficiency - holographic techniques are highly developed for electromagnetic radiation in the visible spectrum. X-ray holographic techniques, however, have not been developed and little, if any, research has been attempted to develop them. Objective - the objective of this research is to develop x-ray holographic techniques that can be utilized to evaluate non-destructively the interior of structural members of aerospace vehicles. How work contributes - this research could lead to the above objective.

Basic studies will be conducted in x-ray optics directed toward a critical evaluation of the feasibility of x-ray holography. The theory of partial coherence will be used to analyze interference methods for the characterizations of x-ray sources, including Das Gupta's narrow line sources. Related studies of recoding media, microscopy, zone place imaging, speckle and photomixing will be performed.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0033, DESIGN AND TESTING OF SMALL COMPOSITE SPECIMENS
A.V. Sharma, University of North Carolina, North Carolina Agricultural & Technical State University, School of Engineering, Dept. of Mechanical Engineering, *N. Dudley St., Greensboro, North Carolina* 27411 (NSG 1631)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

4.0034, COMMUNICATIONS - ELECTRICAL PROPERTIES OF ION-IMPLANTED GALLIUM ARSENIDE
M.A. Littlejohn, University of North Carolina, North Carolina State University, School of Engineering, Dept. of Electrical Engineering, *Raleigh, North Carolina* 27607 (DN475218; N00014-75-C-0827)

Advanced Navy electronic systems will use components fabricated from materials using new techniques. Gallium arsenide is a semiconductor which offers increased capability in electron devices and the technology and physics must be understood and developed for fabricating devices in this material using ion implantation.

Following the implantation of various impurity ions into gas substrates, different surface encapsulants are applied and thermal annealing of lattice damage is carried out. At each stage, transmission electron microscopy (TEM) or diffraction (TED) measurements are made. Identification is made of vacancy segregations, or interstitial segregations, or impurity precipitates or chemical precipitates, as a function of distance from the surface. The resultant defect profiles are correlated with electrical properties of the implanted samples. Silicon dioxide and silicon nitride are used as encapsulants. They are the most commonly used materials and produce different results in almost all cases. Experiments using co-implantation of gallium or arsenic atoms will be carried out to try to understand the effects on the redistribution of impurities seen in previous experiments. Substrate temperature will also be varied.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0035, REDUCTION IN INTERMODULATION DISTORTION IN OPTICAL FIBER COMMUNICATION USING PREDISTORTION
D.A. Smith, North Dakota State University, School of Engineering & Architecture, Dept. of Electrical & Electronic Engineering, *Fargo, North Dakota* 58102 (DF051690; AFOSR-78-3554)

AF function - communications processors in support of our tactical air forces must be capable of handling large volumes of voice, image, and digital data in a rapid, secure manner. In addition, tactical communication systems have requirements for low weight, small size, noise immunity, and elimination of cross-talk. Opportunity -communication via light beams offers an effective and economical satisfaction of these requirements; however, the full advantage of optical communications will not be realized until techniques are found for realizing low-distortion, high signal-to-noise fiber optics communications. Objective - the research will seek techniques for the compensation of nonlinearities in the modulation characteristics encountered in optical modulation used in optical fiber communication. How work contributes - the effort will advance optical communications for military command and control systems.

This investigation will concentrate on predistortion techniques for nonlinearity compensation. Nonlinearities encountered in both light-emitting diodes and optical waveguide modulators will be investigated. Experimental circuits for the compensation of the nonlinear effects encountered in light-emitting diodes will be developed and investigated.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0036, PREDICTION OF SYSTEM INVARIANTS IN THE PRESENCE OF FAILURE
C.F. Martin, Case Western Reserve University, Graduate School, *2040 Adelbert Rd., Cleveland, Ohio* 44106 (NSG 2384)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

4.0037, THERMAL FATIGUE BEHAVIOR OF DIES FOR ALUMINUM DIE-CASTING AFTER DEPOSITION OF VARIOUS ION-SPUTTERED COATINGS
J.F. Wallace, Case Western Reserve University, School of Engineering, Dept. of Metallurgy & Materials Science, *University Cir., Cleveland, Ohio* 44106 (NSG 3279)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0038, INVESTIGATION OF THRUST RECOVERY FOR POWERED LIFT SYSTEMS
P. Bevilaqua, Rockwell International Corp., *4300 E. 5th Ave., Columbus, Ohio* 43216 (DF052320; F49620-78-C-0069)

AF function - advanced aerospace vehicles. Deficiency - lack of experimental data and a theoretical model for jet thrust recovery for powered lift vehicles in the low speed range representative of takeoff and landing. Objective - evaluate a new thrust recovery hypothesis by comparing predictions from a mathematical model based on the hypothesis with experimental data which must be generated. How work contributes -verification of the thrust recovery hypothesis will identify the mechanism involved and provide a theoretical method for predicting and comparing the performance of various powered lift systems. New methods for improving powered lift systems will likely result once understanding of the basic phenomenon of thrust recovery is obtained. Also, data will be generated for an important range of flight speeds where no data is presently available.

A mathematical model for thrust recovery will be formulated for a generalized, two-dimensional powered lift system based on the hypothesis that the thrust recovery results from the interaction between the circulation around the wing section and the vorticity in the jet sheet. The aerodynamic forces and moments predicted by this model will be compared with the results of classical analytical methods, limited existing data for low jet thrust coefficients, and new data to be generated in tests at large thrust coefficients and at large deflection angles.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0039, EQUIPMENT MAINTENANCE
R. Mahone, U.S. Dept. of Defense, Air Force, Avionics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF112510)

RWI is conducting EO sensor experimental and test programs under task 200405, targeting systems characterization. These are documented under 20040533 targeting systems characterization facility, 20040547 laser measurements, 20040552 EO sensor/ATMOS correlation, and 20040553 broadband atmospheric transmission measurements. A considerable amount of in-house automated data handling computer equipment is required to support these efforts. Some is already on-site and in operation and the remainder is being acquired under work unit 20040533. This work unit is to establish a preventive maintenance program for all of the data handling equipment in the building 622 electro-optical facility and the targetings systems characterization facility in area B.

Submission of AF form 9S to base procurement to initiate multiple sole source maintenance contracts with the individual equipment manufacturers.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Avionics Lab.

4.0040, IR THREAT WARNING RECEIVER CONCEPTS DEVELOPMENT PROGRAM
R.B. Sanderson, U.S. Dept. of Defense, Air Force, Avionics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF098240)

The objective of this effort is to provide the AF with an independent test and evaluation capability for advanced IR warning receivers and to support IR background and target signature measurements. The facility will have the capability of simulating several possible threats and background phenomena to (1) obtain baseline data prior to and during flight test and (2) to assist in establishing guidelines for future development. Current capability is limited to evaluation of IR sensors/systems in a static, benign, single threat environment.

Missile launch and separation will be simulated by movement of a beamsplitter transmitting the IR energy from two blackbody sources onto an off-axis parabolic collimator. Signal-to-noise ratio and sky background can be simulated by controlling the temperature of a screen or fluid tank covering the field of view of the IR sensor.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Avionics Lab.

4.0041, AN INVESTIGATION OF THE HIGH-FREQUENCY PERFORMANCE OF SERIES RESONANT INVERTERS
T.A. Stuart, University of Toledo, Graduate School, *2801 W. Bancroft St., Toledo, Ohio* 43606 (NSG 3281)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0042, ASTROGEODETIC MEASUREMENT OF VERTICAL DEFLECTION WITH GPS AND ADVANCED INS
L. Chin, U.S. Dept. of Defense, Navy, Naval Air Development Center, Communication Navigation Tech Directorate, *Warminster, Pennsylvania* 18974 (DN881606)

Determine feasibility of improving vertical deflection measurement techniques developed in the late sixties. Although successful, this earlier work could only provide gross measurements. It may now be possible to obtain more accurate measurements by using new systems such as advanced inertial navigation system (INS) and global positioning system (GPS). These new systems provide precise astronomical (INS) and geodetic (GPS) navigation information which may be used to obtain astrogeodetic measurements directly and continuously. This would significantly reduce the time currently required for gravity surveys and might also provide an on-board capability to enhance submarine navigation accuracy in unmapped areas.

Perform theoretical analysis of advanced INS and NAVSTAR GPS output as a means to detect/identify deflection of the vertical (problem involves separating the desired output from INS errors and from geodetic reference errors). The following steps will be taken: a. Consider INS/GPS configurations and develop algorithms for vertical deflection measurement in conjunction with the normal INS data processing procedure (e.g., optimal filtering). b. Write a simulation computer program using the algorithm developed in step a. This will use both artificial and real data (as available). c. Perform computer simulation and ascertain accuracy of Vertical deflection measurement and INS error reduction. d. Investigate real time implementation requirements and requirements for operational system changes.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

4.0043, SIMULATION DISPLAYS - WIDE FIELD OF VIEW
R.L. Jones, U.S. Dept. of Defense, Navy, Naval Air Development Center, Systems Directorate, *Warminster, Pennsylvania* 18974 (DN781476)

The general objective of this task is to examine the state-of-the-art concepts for generating wide field-of-view displays and to consider their applications to out-the-window scene generation for flight simulators. Recent advancements in computer-generated imagery, video projection systems, electro-optics and large diameter cathode ray tubes have given impetus to the development of a broad spectrum of display systems. The application of this technology to flight simulators and the presentation of visual cues to flight crew is the specific objective of this task.

Survey the state-of-the-art in the technologies of electro-optics, computer-generated imagery, optical projection systems and multi-cathode ray tube display systems. A paper study and design concept will follow which will address the future display requirements for NavAirDevCen simulators. The design concept and the resulting document will signify the completion of the first phase of this project. The second phase of this task will be to design a wide field of view visual display system utilizing the requirements and design concept obatined in phase 1 of this study. The phase 3 effort of this study is to explore the electronic interface requirements and resulting alternative designs for the display system. The research which led to the design concept of the first phase identified some unique electronic synchronization and modulation problems. Design concepts which address these problems will be explored in phase 3.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

4.0044, METHODOLOGIES FOR OPTIMIZING MAINTENANCE MODELS FOR ADVANCED AVIONICS CONTROL SYSTEMS
M.K. Shaefer, College of William & Mary, Williamsburg College, School of Arts & Sciences, Dept. of Economics, *Ewell Hall, Williamsburg, Virginia* 23185 (NSG 1625)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

4.0045, ORDER REDUCTION OF STRUCTURAL DYNAMIC EIGENVALUE PROBLEMS
L.R. Anderson, Virginia Polytechnic Inst. & State University, *Blacksburg, Virginia* 24061 (NSG 1627)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

4.0046, DAIS EXECUTIVE SOFTWARE APPLICATIONS TO TRANSPORT NAVIGATION
R. Bousley, Boeing Co., *7555 E. Marginal Way S., Seattle, Washington* 98124 (DF109830; F33615-77-C-1233)

To provide an independent contractor assessment of the DAIS executive software, industry exposure to the J-73 level one compiler and DAIS software development tools and a definition of the interface between DAIS and integrated navigation systems. A combination of unique operational tactics, together with an available inexpensive ground map radar, TACAN, Omega, INS and reliance on visual fix points, will be used to demonstrate the usefulness of the DAIS/integrated navigation system for tactical air-drop and terminal area operations with transport aircraft.

Boeing aerospace lab simulation, jointly managed by AFAL and Boeing, will be conducted for the purposes of evaluating the DAIS/integrated navigation system software performance capabilities in a series of simulated tactical air-drop and terminal area navigation flight profiles. This 'hot bench' simulation will be conducted using contractor-developed sensor software modules and navigation filter, and the DAIS executive software and processing hardware. Where available, actual sensors (i.e., IMU and Omega receiver) will also be used. AFAL will transfer the DAIS compiler, support software, and executive software along with two each GFE DAIS computers, bus control interface units (BCIUS) and console intelligence units (CIUs) to Boeing for the demonstration. The GFE hardware will be returned to AFAL upon completion of the demonstration.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Avionics Lab.

4.0047, VISUALIZATION STUDY OF TURBULENT SPOTS
J.J. Riley, Flow Industires Inc., *21414 68th Ave. S., Kent, Washington* 98031 (DF052140; F49620-78-C-0062)

AF function - aerospace vehicles. Opportunity - provide a better understanding of the coherent structures in a turbulent boundary layer and the events leading to transition to turbulence. Objective - visually observe a flat plate boundary layer with turbulence and turbulent spots imbedded within to provide information

and understanding of the physical processes of transition to turbulence and maintenance of turbulence. How work contributes - the AF is interested in boundary layer control to reduce or control the effects of drag and flow separation. As yet what triggers transition to turbulence, how best to maintain laminar flow or prevent separation of the structure of a turbulent boundary layer are not known or fully understood. This research will provide visual insight into these problems to aid the design of future aerospace vehicles.

Flow visualization techniques of fluorescent dye layers, dye injections and shadowgraph of flow over a flat plate in a tow tank will be used to study the structure of turbulent spots and their interactions in a laminar boundary layer. The characteristics of a fully turbulent boundary layer will be studied using the same techniques. In the second year the Tollmien-Schlicting waves and the detailed velocity field will be investigated quantitatively.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0048, STRUCTURAL OPTIMIZATION BY FINITE ELEMENTS

G. Sander, Universite de lEtat a Liege, *Rue des Bonnes Villes 1, Liege, Belgium* (DF052830; AFOSR-78-3652)

AF function - improved structural efficiency can enhance the performance of future Air Force flight vehicles. Opportunity - new digital computer systems make possible the study of analysis methods used to achieve minimum weight high performance designs. Objective - to develop efficient and accurate analysis methods in order to develop minimum weight aircraft designs. How work contributes - integrated methods to improve the design of aircraft structures will directly assist future light-weight vehicles.

Research will extend the previous efforts to develop rigorous solution procedures to minimum weight structural design problems using a mixed method which involves both optimality criteria and mathematical programming. Development of an efficient and accurate algorithm to control the convergence of the method will be studied in order to select critical constraints, particularly stresses, that require exact linearization. Extension of the mixed method approach will study dynamic constraints on mode shapes, frequencies and stress levels.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production and Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, ANALYSIS OF VIKING INFRARED THERMAL MAPPING DATA OR MARS - MARS ORBITER AND COMET MISSIONS

D.O. Muhleman, California Inst. of Technology, Graduate School, Dept. of Geological & Planetary Science, *1201 E. California Blvd., Pasadena, California* 91109 (NSG 7565)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0002, ATMOSPHERIC DYNAMICS FROM VIKING LANDER DATA

J.A. Ryan, California State University & Colleges, California State University, Fullerton Campus, Graduate School, *800 N. State College Blvd., Fullerton, California* 92631 (NSG 7614)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0003, MASS AND ENERGY TRANSPORT BY INTERNAL GRAVITY WAVES

P.F. Lester, California State University & Colleges, San Jose State University, School of Science, Dept. of Meteorology, *Washington Sq., San Jose, California* 95192 (ATM7712246A03)

Previous results have demonstrated a significant vertical transport of mass and energy across stable atmospheric layers in the San Francisco, Pacific Ocean region. This research will attempt to quantify this transport, to verify the physical model that has been suggested and to formulate these fluxes in terms of commonly measured atmospheric quantities. The instrumented Mt. Sutro Tower, along with aircraft and an ocean vessel, will be used to obtain the measurements.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0004, NAVY ENVIRONMENT - INFRARED ATMOSPHERIC PROFILING

C.R. Claysmith, General Dynamics Corp., Convair Aerospace Division, *P.O. Box 1950, San Diego, California* 92112 (DN575314; N00014-75-C-0940)

Operation of Navy aircraft near the sea surface and naval combatants on the sea surface require accurate and timely environmental information which will allow the operational commander to fully assess his options. The paucity of available environmental information over the oceans compounds the Navy's problem of accurately forecasting atmospheric conditions. An infrared profiler will provide a reliable, easily maintained, automatic remote sensor for the measurement of water vapor and temperature in the vertical from the surface up to 7 km.

The remote infrared atmospheric profiling system (RIAPS) is presently at the contractor's facility. This work consists of an examination of the software associated with the RIAPS computer, looking to the incorporating statistical models based on available meteorological data of a particular location. This will reduce computer running-time and improve the accuracy of the retrieved temperature and humidity profiles.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0005, REMOTE SENSING AND EVALUATION OF MARINE ENVIRONMENT AND MATERIALS

T.R. Kretschmer, U.S. Dept. of Defense, Navy, Civil Engineering Lab., *Port Hueneme, California* 93043 (DN687120)

To develop a technique to allow the in-situ continuous monitoring of marine materials. This method will allow continuous monitoring of such things as leaching rates of underwater antifouling materials, decomposition of paint matrix, fouling rates on submerged surfaces, scale build-up on inaccessible surfaces, etc.

The basic principle which will be used is that the heat transfer out of a heated thermal element is affected by the thermal conductivity of various layers which build up on or are removed from submerged surfaces. Effects on materials such as fouling rates and scale buildup will be determined by the effect they produce on the rate of heat transfer. The thermal current sensor and associated electronics being developed under work unit number 3.1110-1 - current measurement system for ocean engineering, will be used to perform both laboratory and ocean experiments to evaluate this approach to the remote sensing problem.

SUPPORTED BY U.S. Dept. of Defense, Navy, Civil Engineering Lab.

5.0006, NAVY ENVIRONMENT - MERGING SATELLITE AND CONVENTIONAL OCEANOGRAPHIC DATA

R.L. Bernstein, University of California, San Diego Campus, Scripps Inst. of Oceanography, *P.O. Box 1529, La Jolla, California* 92038 (DN775736; N00014-75-C-0152)

Fleet activities and ASW require a knowledge of surface wind and ocean wave and thermal conditions over broad areas. This is possible only with quantitative remote sensing. In order to scientifically understand and process the remote sensing data, it must be made available to competent oceanographers for physical analysis and correlation.

This work unit will allow Scripps to study the hardware, software, and scientific requirements necessary to gain a significant satellite capability and to demonstrate to appropriate funding

sources their need for such data and a rational program for exploiting the data with high-quality basic oceanography. The use of satellite-observed sea surface temperature, P-3, AXBT data and NORPAX TRANSPAC data will be field-tested in conjunction with a U.S. naval oceanographic office experiment in the mid-latitude north Pacific during the period July to September 1977. This experiment will lay the ground work for Navy and academic collection of data for forecasting in the ocean research experiment (FORE), an experiment in ocean fronts forecasting planned for the summer of 1978.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0007, INITIAL STUDIES OF MIDDLE AND UPPER TROPOSPHERIC STRATIFORM CLOUDS
S.K. Cox, Colorado State University, School of Science, Dept. of Atmospheric Science, *Fort Collins, Colorado* 80523 (NSG 5357)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0008, REMOTE LASER MEASUREMENT
Batlin, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Lab., *Boulder, Colorado* 80302 (8AA74278)

PROJECT OBJECTIVE: To investigate the possibilities for practical remote temperature measurements in the atmosphere on the basis of the Doppler broadening of the molecular spectrum. The basic principle is to measure the broadening of laser light scattered by molecules.

CURRENT YEAR PLAN: Operate a system which should be able to provide data which can be compared with theoretical predictions of the spectra from the lower part of the atmosphere for the effect of collective phenomena. The system is based on scanning both in height and in frequency.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Lab.

5.0009, THEORETICAL STUDIES OF ODD NITROGEN IN THE MESOSPHERE AND LOWER THERMOSPHERE
D.W. Rusch, University of Colorado, Boulder Campus, Graduate School, *1200 University Ave., Boulder, Colorado* 80302 (NSG 5372)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0010, MEASUREMENT OF SOLAR SPECTRAL IRRADIANCES AT WAVELENGTHS BETWEEN 40 AND 3100 ANGSTROMS
J.G. Timothy, University of Colorado, Boulder Campus, Graduate School, *1200 University Ave., Boulder, Colorado* 80302 (NSG 7559)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0011, NAVY ENVIRONMENT - HEAT AND MASS TRANSFER IN THE UPPER OCEAN
J.A. Kaiser, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN580046)

The objective of this work is to develop predictive models of temperature, salinity and currents in the boundary layers of the ocean. These fundamental variables and their interactions with other environmental factors are of great importance in the design, development and optimization of naval weapons and surveillance systems and in remote sensing.

Ocean boundary layers are examined with at-sea and laboratory experiments and with theoretical models. The field program for the upper ocean is primarily concerned with the study of heat-transfer processes and small scale variability in the upper ocean layer with emphasis on the processes directly related to the ocean skin temperature. The Benthic boundary layer studies of structure and variability are executed with a CTD and implanted current meters. Joint experiments with G01-07, G01-19 and G01-20 are executed when appropriate.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

5.0012, INTERPRETATION OF ARCTIC AIRBORNE GEOPHYSICAL INVESTIGATION
L.C. Kovacs, U.S. Dept. of Defense, Navy, Naval Research Lab., Acoustics Div., *Washington, District of Columbia* 20375 (DN780029)

To combine the various aeromagnetic and bathymetric data sets acquired by the U.S. Naval Oceanographic Office and Naval Research Laboratory into a single data format; to display these and other data on standard Arctic projections using digital plotters. Displays will include (a) profiles of residual intensity along the track; (b) residual annotated along track and contoured; and (c) bathymetric contour charts. To compare U.S. Navy data with Soviet 'zebra-stripe' depictions; to assess the accuracy and data density of Soviet work. To develop or adapt software for computing depth to magnetic basement, magnetization times layer thickness and rotation of crustal isochrons defined by magnetic lineations; to apply these techniques to the Arctic data set.

Since large amounts of graphic output are needed, the approach will be to massage and display the data on-line using minicomputers. The first step will be to convert all software and Arctic data tapes and digitize analog records as required. If possible, existing programs will be acquired from other agencies doing comparable work.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0013, GEOPHYSICS AND THERMAL EVOLUTION OF SMALL PLANETARY OBJECTS
Unknown, University of Hawaii System, Manoa Campus, Graduate School, *Spalding Hall, Room 359, Honolulu, Hawaii* 96822 (NSG 7597)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Headquarters

5.0014, MARS SURFACE UNIT DEFINITION CHARACTERIZATION
Unknown, University of Hawaii System, Manoa Campus, Graduate School, *Spalding Hall, Room 359, Honolulu, Hawaii* 96822 (NSG 7590)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Headquarters

5.0015, CHARACTERIZATION AND EVOLUTION OF APOLLO 15 DRILL CORE SOILS, AND THE ORIGIN OF GREEN GLASS VITROPHYRES
A. Basu, Indiana University, Bloomington Campus, Graduate School, *2805 E. 10th, Bloomington, Indiana* 47401 (NSG 9077)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Johnson Space Center

5.0016, SECOND-ORDER CLOSURE SCHEMES FOR PLANT CANOPY AERODYNAMICS
R.H. Shaw, Purdue University, School of Agriculture, Dept. of Agronomy, *Life Sciences Bldg., West Lafayette, Indiana* 47907 (ATM7819252)

Agricultural crops, forests, and other natural vegetation create and inhabit an environment critical to a diversity of biological and physical processes. While it is not often possible to manipulate the structure of a plant canopy in order to adjust this microclimate to advantage, it is important that an understanding be gained of the nature of the environment in which these processes occur.

When relatively homogeneous canopies create a very complex aerial environment which does not lend itself readily to com-

putational analysis because the flow is turbulent and yet the turbulent quantities are, in general, not determined locally. For this reason, the traditional approach using K-theory is not considered adequate and this proposal has as its main objective the development of a mathematical model for canopy aerodynamics based on second-order closure techniques. Schemes for closure at this level have been devised elsewhere for boundary-layer flows. These techniques are likely to be equally valid for the rough sublayer although there are problems peculiar to this layer that will be investigated. The sensitivity of the calculated flow to the closure assumptions will be evaluated and the canopy flow model will be used to investigate the transport of a variety of quantities in the canopy environment, again using second-order closure principles.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0017, SATELLITE ALTIMETRY

B. Chovitz, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Ocean Survey, Geodetic Research & Development Lab., *6001 Executive Blvd., Rockville, Maryland* 20852 (836950A5)

Measurements of altitude to the ocean surface from a satellite will provide, in the first approximation, information on the shape of the geoid assuming that sea level corresponds to the geoid, and in the second approximation information on tides, currents, salinity, and sea state which are deviations of sea level from an equipotential surface. The first use of satellite altimetry will therefore be geodetic and serve as a basis for the later oceanographic applications. The altimetry will provide direct dense measurements of geoidal heights on a global scale not possible by any other means. It will also aid in improving the figure of the Earth as a whole in combination with other data.

Technical objective is to carry out analyses and provide computer programs in anticipation of data to be received from satellite altimetry. These programs not only handle altimetry, but provide a precise ephemeris of the satellite, which is required to exploit the precision of the altimetry.

Task is of ongoing nature. It is anticpated that a continuously-improving flow of data from successive NASA satellites will be forthcoming through this decade. Technical reports of progress will be issued when significant results have been achieved.

SUPPORTED BY U.S. Dept. of Commerce, National Ocean Survey, Office of Marine Technology

5.0018, AQUATIC VASCULAR PLANTS AND ALGAE AS POTENTIAL BIOLOGICAL COMPONENTS OF CLOSED ECOLOGICAL LIFE SUPPORT SYSTEMS

G.C. Gupta, University of Maryland, Eastern Shore, Undergraduate School, *Princess Anne, Maryland 21853* (NSG 6034)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Wallops Flight Center

5.0019, ELECTRONIC SPECTRA OF HEATED LUNAR MATERIALS - QUANTIFYING REMOTE SENSED SPECTRA OF HOT PLANETARY SURFACES

R.G. Burns, Massachusetts Inst. of Technology, School of Science, Dept. of Earth & Planetary Sciences, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (NSG 7604)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0020, UV PHOTOABSORPTION INVESTIGATIONS RELATED TO DISTURBED ATMOSPHERES

R.E. Huffman, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF249710)

AF function - communication, surveillance, detection, tracking. Deficiency - predictive capability for electron concentrations and optical atmospheric properties following atmospheric nuclear bursts. Objective - calculations of photodissociation and photoionization rates in the atmosphere, including effects due to nuclear detonation UV fireball radiation. How research contributes - results will be used in computer codes (ROSCOE, RANC IV, OPTIR) employed to predict atmospheric effects and select operating frequencies.

This work unit will lead to revision of chapter 13 in the DNA reaction rate handbook presently entitled 'photochemical processes -solar photoionization rate constants and ultraviolet intensities'. This revision will be accomplished in two steps. The first step is to obtain photodissociation rates, which are not included in the present handbook. The next step is to incorporate the photodissociation rates into a revised chapter. This new chapter will also involve a revision of the photoionization rates to include new measurements. The work will be coordinated with the editors of the DNA reaction handbook. The approach to producing these reports is divided into two phases. In the initial phase, the various geophysical and technical inputs are reviewed separately to be sure that the best current values are utilized for items such as solar flux, atmospheric model, and cross-sections. A central problem in atmospheric photoabsorption is the absorption by molecular oxygen in the region of the Schumann-Runge band structure. New models of this wavelength region will be obtained for use in these reports. The second phase is to produce the draft manuscript from the data acquired in the first phase.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0021, NAVPAC 1-2 AND 3 AND S77-2 SATELLITE DRAG MEASUREMENTS

F.A. Marcos, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF581190)

AF function - airborne surveillance, target acquisition. Deficiency or opportunity - atmospheric density variations with time and space cannot be adequately predicted. Objective - direct density measurements with new satellite-borne accelerometers. Results are analyzed to obtain improved density data as a function of geomagnetic activity and solar flux. How research contributes - in-flight accelerometer drag measurements permit accurate determination of Air Force system satellite ephemerides. Development of more accurate models permits improved satellite surveillance capability.

New SETA (satellite electrostatic triaxial accelerometer) instruments will be launched on AF satellites. The SETA instrument uses a single proof mass to measure accelerations in three orthogonal directions. This is a completely new development and supersedes the earlier technique of flying three orthogonal uniaxial MESA instruments. Density data will be obtained by determining the drag component along the velocity vector. Attitude will be determined from drag components measured by all three axes. The instrument will also be used to monitor spacecraft orbit-adjust thrusts. Data from the ROCA (rotatable calibration accelerometer) experiment on the S77-2 satellite will be reduced and analyzed to obtain aerodynamic drag measurements in near-circular orbits. The ROCA accelerometer is a single axis instrument with the capability to rotate the sensitive axis perpendicular to the velocity vector. This technique permits the determination and removal of inherent bias errors and leads to improved accuracy drag measurements. The accelerometer data will be analyzed to determine variability related to geomagnetic activity at a constant local time and the dependence of density on solar flux during a period of increasing solar activity.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0022, DEVELOPMENT OF STATISTICAL TECHNIQUES FOR FLARE PREDICTION USING OPTICAL AND RADIO OBSERVATIONS

D.F. Neidig, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF580820)

AF function - communications, surveillance, detection, tracking. Deficiency - inadequate knowledge of solar environment, disturbances, and physics limits ability to predict events which disrupt and degrade AF systems. To develop techniques for the interpretation of optical and radio data in order to improve predictions of solar flares and their associated geophysical disturbances. How research contributes - reliable prediction of

flare-induced geophysical disturbances is needed to assure optimum performance and design criteria for AF communication, detection, and navigation systems. The effort in this in-house work unit is directed toward the identification and early detection of the solar conditions leading to flares.

To predict solar flares and their associated geophysical disturbances requires: (1) identification of solar active regions which will be flare productive, (2) detection and early recognition of flare phenomena (before geophysically-significant emissions occur), (3) real-time evaluation of flare characteristics which lead to geophysical effects. Observable parameters relating to these areas, collected from optical and radio data, will be systematically evaluated in order to determine the parameters which are most significant in predicting both the occurrence of flares and their geophysical importance. The procedure will use a multivariant discriminant analysis (MVDA) which, in addition to identifying the significant parameters, is also capable of making flare predictions from active region data. Optical data from the AWS/SOON network, as well as microwave data from supporting contracts, will be incorporated with observations made at Sacramento Peak Observatory in order to determine the significance of suggested prediction parameters. ACWU entitled 'sunspot dynamics' will provide flare parameters.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0023, S3-TRAPPED PROTON FLUX MEASUREMENT
A.G. Rubin, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF248920)

AF function - reliability, cost-effectiveness, lifetime and survivability of operations space systems. Deficiency - knowledge of the energetic particle environment necessary to adequately predict the reliability and lifetime of space systems. Objective - to determine the transient and steady state energetic particle environment and to indicate possible effects on spacecraft performance and lifetimes. How research contributes - an extended data base from AF satellites will be used to construct realistic static and dynamic models of the near-earth particle environment.

Data from the S3-3 satellite currently on magnetic tapes will be sorted according to magnetic field, location, and time. After background correction, particle population will be compared to previously available data. Since S3-3 data is collected from higher altitudes than previous satellites, data will be available for some regions and at same energy ranges not previously available. For previously unobserved phenomena, comparisons will be carried out employing magnetospheric dynamical theories.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0024, FEASIBILITY OF SENSING ATMOSPHERIC OPTICAL PARAMETERS AT TACTICAL ALTITUDES
R. Toolin, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF580240)

AF function - electro-optical offensive/defensive weapon delivery, optical guidance, communications. Deficiency - insufficiency of IR optical atmospheric profiles to verify and to improve transmission and scattering codes. Objectives - to define and to specify the mobile field instrumentation and operational techniques necessary to obtain from-the-ground vertical profiles of the optical characteristics of the atmosphere to tactical operating heights of 3-5 km. How research contributes - by improving the definition of the atmosphere as the optical medium in which the increasingly sophisticated AF electro-optical systems will operate.

Specification of the system will be developed from a literature survey, both technical reports and manufacturers, brochures, from limited laboratory tests to verify potential techniques and instrumentation. The results will be controlled by factors projected, technical and operational value of the data, resource requirements, system mobility, and existing technology only.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0025, STRUCTURAL EVOLUTION AND STRESS HISTORY OF THE THARSIS REGION OF MARS
D. Wise, University of Massachusetts, Amherst Campus, Graduate School, Dept. of Geology, *Amherst, Massachusetts* 01002 (NSG 7571)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0026, THE DYNAMICS OF SMALL CUMULI
J.W. Telford, University of Nevada, System Office, Desert Research Inst., *Reno, Nevada* 89507 (ATM7623361A02)

This proposal describes the recent development in cumulus cloud dynamics arising from the author's work with airborne measurements of airmotion near cumulus clouds. The departures from the previous models are discussed in detail and the conceptual basis of the new ideas are laid-out for consideration. Theoretical work using concepts derived from the interpretation of past measurements seems to offer the best interpretation of the facts known to date. The role of airmotion measurements in several crucial tests are discussed and it is proposed that such measurements can be made with available equipment. The proposal offers the use of the airborne measurement equipment developed at the Desert Research Institute (DRI), using the Litton LN15D inertial platform and the DRI aircraft, to obtain the necessary measurement data.

If this theory is confirmed it will offer a major new insight into the dynamics of small cumuli.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0027, ICE FOG - SUPPRESSION AND GENERATION
T.T. McFadden, U.S. Dept. of Defense, Army, Corps of Engineers, Cold Regions Research & Engineering Lab., *P.O. Box 282, Hanover, New Hampshire* 03755 (DA0E8144)

To develop equipment and techniques for suppressing fog generation caused by military operations. To develop ways to eliminate fog from winter operations where its presence shows strategic positions for miles. To develop effective means of generating the fog for concealment or decoy techniques.

Fog suppression by condensation of exhaust effluents has met with limited success. Most of the problems are within present technological capabilities. Devices for eliminating fog from vehicle exhausts will be constructed and tested on military vehicles. Modifications and redesigns will develop the devices into practical working economically-feasible accessories for current vehicles. Fog generation will be accomplished using mist generation techniques combined with air movement devices.

SUPPORTED BY U.S. Dept. of Defense, Corps of Engineers, Cold Regions Research & Engineering Lab.

5.0028, NAVY ENVIRONMENT - ARCTIC OCEAN TECHNOLOGY
R.W. Corell, University System of New Hampshire, School of Technology, Dept. of Mechanical Engineering, *James Hall, Durham, New Hampshire* 03824 (DN475501; N00014-75-C-0929)

This task is to develop a new technology with the view of developing an aircraft-deliverable coring system which can increase the geographical distribution of sediment cores in the Arctic basin and which decreases the time required to obtain individual cores.

The contractor has designed, built and tested a prototype coring system. The tests performed will be analyzed to determine if this coring system will meet the objective or if another system must be designed.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0029, CATALYTICALLY-SUPPORTED THERMAL COMBUSTION OF COAL-DERIVED LOW BTU GAS
J. Releford, Engelhard Industries Inc., Engelhard Industries Division, *430 Mountain Ave., New Providence, New Jersey* 07974 (BA-04-01; EF-77-C-01-2683)

Evaluation of catalyst systems designs and demonstration that a range of low-BTU coal gas fuels can be combusted with low emissions and high combustion efficiency with acceptable pressure losses at industrial turbine operating conditions. Emission requirements will be made of carbon monoxide (CO), carbon dioxide (CO2), unburned hydrocarbons (UHC), and oxides of nitrogen (NOX). This will be performed according to standard procedures as PRE SAE-ARP-1256, Procedures for Continuous Sampling and Measurement of Gaseous Emissions from Aircraft Turbine Instruments.

SUPPORTED BY U.S. Dept. of Energy, Office of Fossil Energy

5.0030, THE ORIGIN OF MAGHEMITE ON MARS
R.B. Hargraves, Princeton University, Graduate School, Dept. of Geological & Geophysical Science, *205 Nassau Hall, Princeton, New Jersey 08540 (NSG 7602)*

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0031, CONVECTION IN SPHERICAL SHELLS
A. Zebib, Rutgers the State University of New Jersey, New Brunswick Campus, Graduate School, *Old Queens Bldg., New Brunswick, New Jersey 08903* (NSG 7601)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0032, VARIABILITY AND REAL-TIME MEASUREMENTS OF METEOROLOGICAL PARAMETERS
B.W. Kennedy, U.S. Dept. of Defense, Army, Electronics Research & Development Command, Atmospheric Sciences Lab., *White Sands M.R., Las Cruces, New Mexico* 88002 (DA0F1768)

Determine variability of tropical and mid-latitude atmosphere above 30 km. Extend usable measurement altitude of robin sphere to 100 km. Test an inflatable radar calibration sphere. Test range rate program for application to Kwajalein Missile Range and White Sands Missile Range sphere missions.

Actively participate in diurnal variability programs at KMR and WSMR and elsewhere. Launch light robin sphere at WSMR and KMR. Launch 12-inch diameter spheres at WSMR and KMR. Run range rate program on robin spheres at WSMR and evaluate results. Act as consultant to Air Force on atmospheric density measurements in support of reentry programs.

SUPPORTED BY U.S. Dept. of Defense, Electronics Research & Development Command, Atmospheric Sciences Lab.

5.0033, ARTIFICIAL FOG STABILIZATION
E.J. Mack, Calspan Corp., *1422 Genesses Ave., P.O. Box 235, Buffalo, New York* 14221 (DN890087; N00019-78-C-0349)

A laboratory investigation will determine: (a) the efficiency of pyrotechnically-generated, hygroscopic aerosols in producing conditions of restricted visible and infrared wavelength transmission and, (b) the persistence of these fogs using evaporation retardants.

Aerosol size spectra and extinction coefficients of aerosol fogs will be made as functions of aerosol concentration and relative humidity.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

5.0034, PARTICIPATION IN THE MARS DATA ANALYSIS PROGRAM - ANALYSIS OF CLOUD FORMS IN VIKING AND MARINER 9 IMAGES
P.J. Gierasch, Cornell University, Ithaca Campus, School of Arts & Sciences, Dept. of Astronomy, *Ithaca, New York* 14850 (NSG 7612)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0035, PARTICIPATION IN THE MARS DATA ANALYSIS PROGRAM - GLOBAL & REGIONAL STUDIES OF WIND-INDICATORS ON THE SURFACE OF MARS
J. Veverka, Cornell University, Ithaca Campus, School of Arts & Sciences, Dept. of Astronomy, *Ithaca, New York* 14850 (NSG 7546)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0036, PARTICIPATION IN THE MARS DATA ANALYSIS COMPARATIVE STUDY OF THE SURFACE OF PHOBOS AND DEIMOS
J. Veverka, Cornell University, Ithaca Campus, School of Arts & Sciences, Dept. of Astronomy, *Ithaca, New York 14850 (NSG 7547)*

SUPPORTED BY U.S. National Aeronautics & Space Admin., Headquarters

5.0037, EFFECTS OF PHOTOMETRIC GEOMETRY ON SPECTRAL REFLECTANCE MEASUREMENTS
J. Veverka, Cornell University, Ithaca Campus, School of Arts & Sciences, Dept. of Astronomy, *Ithaca, New York* 14850 (NSG 7606)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0038, DYNAMICAL STUDIES OF PHOBOS AND DEIMOS
J.A. Burns, Cornell University, Ithaca Campus, School of Engineering, Dept. of Theoretical & Applied Mechanics, *242 Carpenter Hall, Ithaca, New York* 14853 (NSG 7593)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0039, MODELING THE VIKING BOUNDARY LAYER AND SOIL THERMAL MEASUREMENTS ON MARS
M.I. Hoffert, New York University, Washington Square & University College of Arts & Sciences, Dept. of Applied Science, *421 1st Ave., New York, New York* 10012 (NSG 7591)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0040, IDENTIFICATION OF TROPOSPHERIC AND STRATOSPHERIC AIR BY TRACER
A.L. Lazrus, State University of New York, Albany Campus, Graduate School, *1400 Washington Ave., Albany, New York* 12203 (NSG 2386)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

5.0041, SURFACE PROCESSES ON MARS AND ITS SATELLITES WITH EMPHASIS ON CRATERING, VOLCANISM AND THE EVOLUTION OF VALLES MARINERIS
J.W. Head, Brown University, Graduate School, Dept. of Geological Sciences, *University Hall, Box 1883, Providence, Rhode Island* 02912 (NSG 7570)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0042, ANALYSIS OF ROCKS AND SUBSTRATE AS REVEALED IN VIKING LANDER IMAGES
T.A. Mutch, Brown University, Graduate School, Dept. of Geological Sciences, *University Hall, Box 1883, Providence, Rhode Island* 02912 (NSG 7569)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0043, ENDOGENIC PROCESSES EFFECT IN THE SURFACES OF GANYMEDE AND CALLISTO
E.M. Parmentier, Brown University, Graduate School, *University Hall, Box 1883, Providence, Rhode Island* 02912 (NSG 7605)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0044, EXPERIMENTAL INVESTIGATION OF BASALT-C-O-H-S GAS EQUILIBRIA AND FUMAROLIC ALTERATION ON MARS
M.J. Rutherford, Brown University, Graduate School, Dept. of Geological Sciences, *University Hall, Box 1883, Providence, Rhode Island* 02912 (NSG 7589)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0045, RESEARCH OF THE GENESIS OF TORNADOES ASSOCIATED WITH HURRICANES
R.G. Gentry, Clemson University, College of Sciences, Dept. of Physics, *Long Hall, Clemson, South Carolina* 29631 (NSG 5350)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0046, TERRESTRIAL RADIOISOTOPE APPLICATIONS DEVELOPMENT
E. Lamb, U.S. Dept. of Energy, Oak Ridge National Lab., *P.O. Box X, Oak Ridge Operations Office, Oak Ridge, Tennessee* 37830 (AG-04-06-02-3; W7405-ENG-26)

The task objective is to provide technical support and development for use of byproduct radionuclides in those applications where radiation, heat or other unique properties of materials recovered from nuclear wastes can be used to conserve energy or natural resources, contribute to the long-term management of nuclear waste, and provide economic or national security benefits. Byproduct fission products will require some type of custodial care for long periods of time. Useful application of these materials can provide this care in addition to making a significant contribution to the economic welfare of the country. In the case of gamma radiation and heat production, byproduct radionuclides are unique and can be used in destruction of water pollutants, radiation processing for sterilization, and as compact, reliable sources of electricity and heat for use in special situations. The fission product stable nuclides of the platinum metal group provide a source of these metals to the United States which may be of strategic importance due to the fact that the country is in a deficient raw material position with regard to these metals. Supplies of krypton-85 are essential to the solid state electronic industry and new uses are being developed for component testing and process control that can provide significant dollar savings in military and commercial aircraft engine operation. Stable xenon, essentially free of radioactivity, can be produced in large quantities and made available to medical, electronic, and lighting industry. (ORNL/CF-78/108)

SUPPORTED BY U.S. Dept. of Energy

5.0047, NAVY ENVIRONMENT - CLOUD ELECTRIFICATION
D.R. Tompkins, Terrene Corp., *Refugio, Texas* 78377 (DN223331; N00014-76-C-0404)

In behalf of in- and through-cloud naval operations involving cloud penetration by vehicles and missiles, the objective of this research is to detect and measure in real time the strength of the in-cloud electric fields.

The complete determination of the vector electric field along the shower axis requires three sets of four phased antennas. This is a mathematical consequence of the inverse solution where each set of four phased antennas acts as a single antenna. Thus a full station actually requires twelve antennas. However, a station with four phased antennas has enough sensitivity to make it possible to evaluate the radio method of measuring atmospheric electrical fields and that is our immediate objective and the approach used in this research.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0048, INVESTIGATION OF MULTIZONED CHONDRULES AND DARK RIM MATERIALS IN ORDINARY AND CARBONACEOUS CHONDRITES
E.A. King, University of Houston, School of Arts & Sciences, Dept. of Geology, *3801 Cullen Blvd., Houston, Texas* 77004 (NSG 7617)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0049, CONTINUED ANALYSIS OF DATA FROM THE VIKING RETARDING POTENTIAL ANALYZER (RPA'S)
W.B. Hanson, University of Texas, Health Science Center at Dallas, Graduate School, Dept. of Physics, *Dallas, Texas* 75230 (NSG 7599)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0050, STUDY OF LAYERED DEPOSITS AND PALEOCLIMATES ON MARS
A. Howard, University of Virginia, School of Arts & Sciences, Dept. of Environmental Science, *Garrett Hall, Charlottesville, Virginia* 22903 (NSG 7572)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0051, INVESTIGATIONS OF MARTIAN METEOROLOGICAL PROCESSES USING VIKING METEOROLOGICAL DATA
C.B. Leovy, University of Washington, School of Arts & Sciences, Dept. of Atmospheric Science, *Seattle, Washington* 98105 (NSG 7611)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0052, SUMMER MONSOON WINDSETS DERIVED FROM THE GEOSTATIONARY SATELLITE DATA OVER THE INDIAN OCEAN
J.A. Young, University of Wisconsin, Madison Campus, School of Natural Sciences, Dept. of Meterology, *Agriculture Hall, Madison, Wisconsin* 53706 (ATM7821873)

During 1979 a U.S. Geostationary Meteorological Satellite over the Indian Ocean will give scientists the first opportunity to view the entire atmospheric monsoon circulation system during one complete annual cycle. The objective of this project is to take advantage of this unique opportunity to obtain complete large-scale wind coverage for the summer monsoon at two heights in the atmosphere. This coverage will include the two experimental areas of Summer MONEX (Arabian Sea and the Bay of Bengal), as well as the southern equatorial Indian Ocean during both the 'onset' and 'established' periods of evolution of the atmospheric monsoonal circulation. MONEX, for Monsoon Experiment, is a regional subprogram of the Global Atmospheric Research Program (GARP) to be carried out concurrently with the First GARP Global Experiment (FGGE) in FY 1979.

This basic satellite cloud-tracking effort will augment the FGGE satellite wind set by providing additional wind vector estimates of two times per day. Each set will be of relatively high resolution in selected, weather significant areas. The data will form an essential part of an eventual comprehensive MONEX wind set as well as augment the FGGE data set. The data will be made available to MONEX researchers in the following forms: (1) basic 'raw' wind set on computer tape, (2) analysis and gridded wind set on computer tape, and (3) a published atlas from (2).

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0053, NAVY ENVIRONMENT - EFFECT OF WHITECAPS ON THE MARINE ATMOSPHERE
E.C. Monahan, National University of Ireland, University College at Galway, *Galway, Ireland* (DN875444; N00014-78-G-0052)

The objective of this research is to relate various physical properties of the lowest 20 meters of the marine atmosphere to whitecap coverage. These atmospheric properties include electrostatic charge concentration, electrostatic potential gradient, sea salt concentration, sea salt gradient, size distribution of sea salt giant nuclei and Aitkin nuclei concentration. The results of this research, as they become available, will be utilized by other investigators attempting to improve the prediction of the vertical distribution of marine aerosols. This in turn will affect the Navy's capability to forecast optical and infrared properties in the marine boundary layer.

This research will involve two complementary experiments, one in the laboratory and one in the field at an exposed maritime location. The laboratory experiment will utilize a whitecap simulation tank for examining whitecap action both visually (photography) and electrostatically. The field experiment will sample unpolluted air as it blows in from the west. Whitecap coverage will be examined in addition to other marine properties.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, SKILL DEGRADATION
G.B. Reid, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Williams Air Force Base, Chandler, Arizona* 85224 (DF223340)

To monitor the decline in performance on a high fidelity aircraft simulator during extended periods of non-practice.

Pilots currently in non-flying jobs will be used as subjects. Subjects will be trained to a predetermined performance level on the advanced simulator for pilot training (ASPT). Rechecks will be conducted in ASPT after varying levels of non-practice to determine rate of skill degradation. The performance will be evaluated in respect to such pilot factors as amount of flying time, type of aircraft flown, and most recent aircraft currency.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0002, LOCALIZATION OF TRIPEPTIDYL AMINOPEPTIDASE AND CARBONIC ANHYDRASE III IN RAT MUSCLES BY LIGHT AND ELECTRON MICROSCOPY
D.A. Riley, University of California, San Francisco Campus, School of Medicine, Dept. of Anatomy, *551 Parnassus Ave., San Francisco, California* 94122 (NCA 2-665903)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0003, CLINICAL APPLICATIONS OF THE LEXISCOPE
H.C. Press, Howard University, Graduate School, *2400 6th St. N.W., Washington, District of Columbia* 20001 (NSG 5378)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

6.0004, EVALUATION OF ION BEAM SPUTTERED BIOGLASS COATINGS OF PROSTHETIC DEVICES
L.L. Hench, State University System of Florida, University of Florida, School of Medicine, Dept. of Surgery, *1600 Archer Rd., Gainesville, Florida* 32610 (NSG 3273)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

6.0005, VIRTUAL IMAGE DISPLAY DEVICE
G. Derderian, U.S. Dept. of Defense, Navy, Naval Training Equipment Center, Physical Sciences Lab., *Orlando, Florida* 32813 (DA0M4995)

An efficient, light-weight, compact, low-cost virtual image display device is needed for future flight trainers and vehicle crew trainers. This device should meet tri-service requirements with specific US Army applications in synthetic flight trainers and tank driver simulators.

The approach is to design and breadboard a system of fresnel lenses on thin plastic plates designed for chromatic correction. Following appropriate testing, a specification will be prepared for future visual system procurements.

SUPPORTED BY U.S. Dept. of Defense, Army, Army Materiel Development & Readiness Command

6.0006, PHYSIOLOGICAL EFFECTS OF SHIP MOTION ON CREW MEMBERS
C.L. Ewing, U.S. Dept. of Defense, Navy, Naval Aerospace Medical Research Lab., Bioengineering Sciences Dept., *New Orleans, Louisiana* 70189 (DN141828)

To determine the physiological effects of ship motion on crew members as induced by high speed vessels and/or aircraft.

Measured ship motion as well as mathematical simulations of advanced surface platforms will be reproduced in the laboratory and then used to stimulate both instrumented human volunteers and large primate subjects on whom physiological and pathological effects will be measured. The data are necessary in the development of medical crew selection and operational criteria for such vehicles and in determining effects of the specific vehicular motion on crew and passengers alike. The tolerance of the human being and primate analog to various durations and intensities of the measured motion will be determined in various postural modes and with various items of equipment.

SUPPORTED BY U.S. Dept. of Defense, Naval Medical Research & Development Command, National Naval Medical Center

6.0007, INVESTIGATION OF ASPERGILLUS FLAVUS
Unknown, University of Maryland, Eastern Shore, Undergraduate School, *Princess Anne, Maryland* 21853 (NSG 6033)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Wallops Flight Center

6.0008, SOIL STABILIZATION BY A PROKARYOTIC TERRESTRIAL MAT IN THE SOUTHWESTERN UNITED STATES - IMPLICATIONS FOR PRECAMBRIAN TERRESTRIAL BIOTA
S. Golubic, Boston University, School of Medicine, Dept. of Biology, *80 E. Concord St., Boston, Massachusetts* 02215 (NSG 7588)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

6.0009, ALLEVIATION OF HEAT STRESS IN AIR CREW COMPARTMENTS (22)
R.F. Goldman, U.S. Dept. of Defense, Army, Medical Research & Development Command, Research Inst. of Environmental Medicine, *Natick, Massachusetts* 01760 (DA0C6130)

Evaluate simple auxiliary cooling approaches to alleviate heat stress fatigue during flights when there is no aircraft cooling system or when use of the environmental control system (ECS) in Army aircraft is prohibited because of high exhaust gas temperatures (e.g. AH-1 helicopters when exhaust temperatures remain above 610 degrees C).

Multipocketed vests, fitted with plastic water containers, have been developed for use in alleviating the heat stress during work in the heat and high humidity of deep mines. The vests, kept in a freezer or donned just prior to entry into the mine, are worn under the outer garments and over underclothing. They are reported to provide 4 to 6 hours of effective working time with

minimum discomfort. Such vests will initially be evaluated on the heated, sweating copper man to measure the actual cooling provided and thereby assess the environmental range and time duration of probable utility. Thereafter, collaborative studies with USAAMRL (Ft. Tucker) will be carried out, first on test subjects in climatic chambers at USARIEM and then, if warranted, during actual flight operations using air crew as subjects.

SUPPORTED BY U.S. Dept. of Defense, Medical Research & Development Command, Research Inst. of Environmental Medicine

6.0010, VENTILATORY CONTROL MECHANISMS AT HIGH ALTITUDE (22)

J.T. Maher, U.S. Dept. of Defense, Army, Medical Research & Development Command, Research Inst. of Environmental Medicine, *Natick, Massachusetts* 01760 (DA0B6132)

The physiologic processes which control the ventilation of man at high altitude are not fully understood. The objective of this work unit is to gain new knowledge of ventilatory control, with emphasis on adaptations within the control system during exposure to chronic hypoxemia, as experienced during sojourn at high terrestrial altitudes. A thorough understanding of this aspect of altitude physiology is essential in defining new approaches for enhancing the adaptation of the soldier to high terrestrial elevations.

An integrated program is under way to analyze the contributions of both the carotid boyd and medullary chemoreceptors to the ventilatory adaptations of man to hypocapnic hypoxia, including interactions between the two chemoreceptors. Techniques which would allow the identification stage, additional studies to determine the relationship between the ventilatory controller and effector, as exemplified by influences of increased inspiratory flow resistance on the ventilatory response of man to hypoxia or hypercapnia are included.

SUPPORTED BY U.S. Dept. of Defense, Medical Research & Development Command, Research Inst. of Environmental Medicine

6.0011, BEHAVIORAL MODIFICATION AS AN APPROACH TO WEIGHT CONTROL IN THE AIR FORCE

O. Maller, U.S. Dept. of Defense, Army, Natick Research & Development Command, *Natick, Massachusetts* 01760 (DA0H4365)

To develop an effective, integrated, individualized and prototypic program for the self attainment and maintenance of military standards of body weight for AF flying personnel. This program will make available to personnel those techniques which have demonstrated to be effective in the self-management of food habits and physical activity patterns.

Quantify and measure food selection and consumption patterns, and physical activity patterns of target population before and following the introduction of weight loss and maintenance programs. The techniques of behavior modification will be evaluated and then selected on the basis of the efficacy for individualized use to attain and maintain body weight standards of the Air Force.

SUPPORTED BY U.S. Dept. of Defense, Army, Natick Research & Development Command

6.0012, AUTOMATICITY AND SKILL ACQUISITION IN A MULTIPLE TASK

J.E. Regan, University of North Carolina, Chapel Hill Campus, Graduate School, *Chapel Hill, North Carolina* 27514 (NSG 2390)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0013, INFLUENCE OF SURFACE MORPHOLOGY MODIFICATION BY ION BEAM SPUTTERING ON TISSUE RESPONSE TO PERCUTANEOUS IMPLANTS OF VARIOUS COMPOSITIONS

D.F. Gibbons, Case Western Reserve University, School of Engineering, Dept. of Biomedical Engineering, *University Cir., Cleveland, Ohio* 44106 (NSG 3282)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

6.0014, BIODYNAMIC DESIGN CRITERIA FOR EMERGENCY ESCAPE SYSTEMS

J.W. Brinkley, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF312330)

To develop acceleration exposure limits and protection equipment requirements for operational and advanced ejection seats and crew escape modules. The effort will result in the development of new escape system specifications and upgrading of existing specifications in the U.S. Air Force aerospace systems development program in order to minimize personnel injury during emergency escape.

Acceleration and windblast environments currently experienced with operational escape systems or predicted for advanced systems will be studied analytically and experimentally to develop human exposure limits. The exposure limits will be expressed in terms of mathematical analogs and verified by comparison with current operational injury rates associated with specific environments and by tests using human subjects. The resulting analogs will be used to study the degree of protection or hazard provided by specific personnel equipment configurations. The study results will be verified experimentally.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0015, HUMAN PHYSICAL CAPABILITIES FOR AF JOBS

J.W. McDaniel, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF320950)

To improve the data base for describing the mobility, strength, and endurance variability of AF men and women where existing data are inadequate for the design, operation, and maintenance of AF systems. To improve systems effectiveness by developing designs for controls comparable with the operator's capabilities. To assess the adequacy of female strength and endurance characteristics for assignment to the role of aircrew members. To improve the design and placement of aircraft controls to minimize performance degradation from acceleration.

Methods are being employed to measure static strength and body mobility characteristics (FY 77-78). New methods for measuring dynamic strength and endurance are being investigated in FY 78-80. Equipment and procedures are being developed to measure and record the human operator configuration while performing aircrew-related tasks. To provide control design recommendations directly to procuring activities or through technical reports or design standards to improve the efficiency and operability of AF systems. Design complex controls based on the biomechanical characteristics of the hand to reduce the incompatibility between the precise operation of a control and its secondary control. Activation of controls in conventional and high acceleration cockpits is being investigated. The effects of encumbering and restrictive equipment and clothing on operator performance is being investigated. A methodology will be developed in FY 77 for use by AFFTC to evaluate flight control resistance characteristics of new systems.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0016, EVALUATION OF HEARING PROTECTORS USING ANSI REAT METHOD

M.R. Stephenson, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF321330)

AMRL/BBA is responsible for evaluating personal hearing protectors for use in AF hazardous-noise environments. The objective of this effort is to maintain our on-going program of investigating hearing protection performance of helmets, head-sets and other sound protective devices. Hearing protectors submitted for evaluation will be measured for compliance with criteria established for acceptance on the Air Force qualified products list

(mil spec 38268B) and considered for potential widespread or special purpose use in AF noise environ.

Human subjects will be employed in the laboratory evaluation of a hearing protector's sound attenuation characteristics as measured by the American National Standard Institute (ANSI) real ear attenuation at threshold (REAT) method. Results of these evaluations will be used to formulate recommendations to the office of the AF Surgeon General concerning potential application for AF use. Data will be processed and prepared in formats consistent with general methods used by the scientific community as well as the AF for estimation of noise reduction in operational situations. This effort assures that our data base is current by evaluation of the many modified and new devices appearing on the commercial market in increasing numbers.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0017, EJECTION SEAT CATAPULT TESTING UNDER HIGH G

C.G. Toler, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF324420)

The design, manufacture and acceptance of ejection seat catapults are based entirely upon the performance during qualification tests under 0 g or 1 g conditions. However, both current and future aircraft with full authority flight control systems increase the probability that the aircraft will be under high g maneuvering loads or under high loads after departure from controlled flight at the time of ejection initiation. The ejection forces produced by the escape system under these conditions cannot be predicted on the basis of the available data at 0 and 1 g. Without measurements or prediction of these forces it is impossible to predict the injury potential associated with ejection under these conditions or the nature of catapult redesign that might be required. The objective of this research effort is to obtain experimental data on the behavior of several ejection seat catapults while they are under an acceleration field. The dynamic performance of 36 ejection seat catapults will be measured while the catapults are subjected to varied acceleration fields. The acceleration fields will be created using AMRL horizontal impact facilities. A payload sled (weighing 300 to 450 pounds) will be ejected from the accelerated impact sled of the facility using several different catapult types. The resulting data will be used to develop and validate mathematical models of ejection catapults that can be used to predict their performance under operational high g conditions.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0018, PILOT WINDSCREEN FACTORS

W.L. Welde, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF321100)

The objective of this effort is to (1) obtain empirical field data on the visual effects that are observed in various operational aircraft windscreens by the aircrews, (2) define the critical visual tasks that may be affected by degraded optical windscreen qualities, (3) relate task requirements to specific areas of the windscreen as appropriate for each aircraft, (4) acquire quantitative and qualitative flight and simulation experimental data of specific optical effects upon pilot visual task performance, and (5) correlate pilot visual task performance with existing and laboratory-developed windscreen distortion measures.

The initial effort will consist of evolving methodologies for accomplishing each of the objectives previously outlined. This will result in the development of an interview technique and questionnaires for obtaining detailed information from aircrews related to what visual aberrations are observable in various aircraft windscreens, their location and effect upon critical visual tasks. Experience and knowledge will be gained on windscreen optical effects and pilot visual tasks by interacting directly with the aircrews at operational bases and test centers and, whenever possible, participating in tactical training flights in the appropriate aircraft. An analysis of critical visual tasks will be directed primarily towards visual tasks encountered by pilots flying the F-111, FB-111, and the F-16 aircraft because of the requirement for low-altitude high-speed flight and the ever-present birdstrike hazard in this flight regime. An inflight investigation will be conducted with the AFFDL C-13LH TIFS (total inflight simulator) aircraft operated by CALSPAN to determine if selected FPG distortion panels affect safety, fatigue, and pilot visual task performance levels.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0019, IMPROVED WINDSCREENS

C.P. Hatsell, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF322650)

Specify optical design and quality control criteria for multilayer aircraft windscreens to optimize system safety and effectiveness.

Apply techniques of geometrical optics and optical physics to develop methods of and devices for quantifying windscreen distortion, and relate these distortion measures to windscreen geometry and materials. Determine the feasibility and materials specifications for antireflectant coatings to reduce multiple imaging phenomena in thick windscreens of complex geometry. These measures and specifications will direct materials and manufacturing technology toward windscreen improvement for enhanced operational capability.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0020, AVIATOR'S BREATHING OXYGEN CONTAMINANT ANALYZER

K.G. Ikels, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF322290)

Headquarters, Air Training Command, issued required operational capability NR. ATC 2-72 in June 1972 for a portable oxygen contaminant analyzer. This ROC is for an immediate analysis capability for oxygen samples taken from aircraft following an inflight physiological incident where aviator's breathing oxygen is implicated. The ATC ROC was validated by HQ USAF on PMD NR. R-Q-3-013-(1), dated 21 July 1972. The objective of this effort is to develop a portable contaminant detector for base level personnel to perform oxygen analysis in accordance with use limits specified in T. O. 42B6-1-1.

Feasibility of a miniaturized portable infrared analyzer for field detection of use limit contaminants was demonstrated in OT and E program conducted in FY 74. The instrument transitioned to engineering development in late FY 74 and is now managed by the ASD/AEL under endeavor AO258. Major effort in FY 76 was the design modification and systems procurement. Operational T and E will be conducted in FY 77 and initial inventory deployment in FY 78. Previous accomplishments in this work area are documented under work unit 71641601. This effort is being transferred to implement a new technology planning objective as directed by HQ Aerospace Medical Division.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0021, THERMAL STRESS INSTRUMENTATION

R.F. Stribley, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF320100)

The purpose of this project is to design and construct a modified miniature environmental monitor (MEM) for use by the USAFEHL in conducting field thermal stress studies. Instrumentation presently available for thermal stress surveys are behind current technology, require frequent calibration, are of questionable precision, and do not measure all of the variables affecting the heat transfer of bodies within an environment. This joint effort will augment existing USAFSAM capabilities of field data collection and provide additional input, as a data base, to the thermal stress program.

In order to meet the Environmental Health Laboratory's needs, USAFSAM/VNT plans to modify the design of the existing MEM to include multiple black globes and temperature sensors. Also, a digital recording system will be utilized to increase total system accuracy.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0022, USAF CENTRALIZED WAIVER REPOSITORY (WAVR FILE)

G.O. Tolan, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF322050)

To tabulate in a readily-available computerized form the essential medical data on rated personnel who receive waivers for medical defects in order to continue flying duties. To provide to the Surgeon General, USAF, and to the surgeons of the major air commands, on a periodic basis, the information required to assure timely administrative review of waivers and appropriate evaluation or reevaluation of significant medical problems in flying personnel.

AFM 160-1, paragraph 3-6D(6), requires submission of identification and medical data to USAFSAM by waiver authorities every three months. Information from the USAF Military Personnel Center regarding changes in base and command of assignment is also entered. Publication of the file is also accomplished on a quarterly basis. In addition to a master file, or complete list, sent to the Surgeon General's office, each major Air Command Surgeon's office is furnished with a list of individuals within that command and a suspense list (by waiver expiration date) for the following three months. Capability will be maintained for searching the file for any diagnostic or other medical terms and will be responsive to requests from the major Air Command or Surgeon General's office to provide information as required. Work was formerly documented under work unit 7755-14-02.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0023, STEREO ACUITY

T.J. Tredici, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF323040)

The traditional decision-point in ophthalmologic considerations regarding flying status has been differentiating those individuals with a phoria from those with a manifest deviation or tropia. Those with tropias (crossed eye) have not been qualified for flying status because of defective stereoscopic vision and their almost universal failure of the depth perception tests. A distinct category of patients between these two extremes has not been identified in the patient population of the aeromedical consultation service. These individuals do indeed have a tropia but one of extremely small degree. These individuals do retain some degree of stereoscopic vision, and many can pass one of the USAF depth perception tests. The term developed for this type of disorder is 'microtropia.' Following a battery of motility testing procedures, a number of USAF flying personnel have been recommended for waiver for continued flying status. Since this is a totally new entity in the ophthalmologic field, the true nature of the process, its causes and ultimate prognosis -- i.e., progression to greater visual disability--are not yet clearly delineated. The objective of this work unit is to continue to follow such patients over time to provide the presently lacking new knowledge and to validate the established policy of continued flying for individuals with this condition. New stereoscopic testing equipment needs to be developed. Presently available testing devices are not sufficiently sensitive to carry-out some of the tests desired.

Those USAF aircrew members referred to the Ophthalmology Branch, Clinical Sciences Division, who have failed the USAF stereoscopic depth perception test will be put through an extensive battery of diagnostic tests to determine the cause of their failure. If the etiology of their failure is microtropia, they will be followed under this unit for aeromedical assessment regarding stability or progression. As new knowledge regarding this entity is developed, it will be transmitted to the field for utilization in all Air Force medical facilities and further disseminated to civilian and military ophthalmological community through publication of scientific papers. An attempt will be made to develop new and more refined stereoscopic testing devices by contractual effort. Work was formerly conducted under work unit 77550905.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0024, CLINICAL EVALUATION OF G-SENSITIVE MEDICAL CONDITIONS IN AIRCREW

J.E. Whinnery, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF323590)

Assessment of the plus GZ tolerance of aircrew members having various medical abnormalities in an effort to determine their ability to perform safely and effectively in an increased plus GZ environment. Establishment and refinement of plus GZ tolerance norms for clinical aeromedical use. Determination of the effects of specific medical therapeutics on plus GZ tolerance.

Asymptomatic aircrew members referred to the USAFSAM Aeromedical Consultation Service for evaluation of certain medical abnormalities (e.g. cardiac vascular abnormalities, cardiac arrhythmias, hypertension, abnormal exercise tolerance tests, unexplained syncope and loss of consciousness in flight) will be subjected to specific plus GZ stress profiles on the USAFSAM human centrifuge. G tolerance will be measured to determine if their medical abnormalities significantly affect their plus GZ tolerance. Establishment of a USAFSAM acceleration repository for input of all g-tolerance data has been accomplished so that easy retrieval and more formalized reporting of this information will be available. Further study into the validity of the specific g-test profiles will continue and will be compared with results of other clinical tests. Relaxed g-tolerance norms using a specific medical evaluation protocol have been established.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0025, CRITERIA FOR ABNORMAL ECG RESPONSE TO EXERCISE STRESS TESTING USING 3-DIMENSIONAL ANALYSIS OF ORTHOGONAL LEAD SYSTEMS

R. Wolthuis, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF321830)

Less than 50 percent of aircrew members subjected to coronary arteriography because of an abnormal electrocardiographic response to exercise stress testing have obstructive coronary artery disease. This effort will better define normal versus abnormal criteria of interpreting electrocardiographic responses to exercise stress testing using widely-accepted orthogonal lead systems to establish a more reliable immediate risk identification of aircrew members with potential coronary artery disease.

Orthogonal electrocardiograms will be recorded during exercise stress testing and subjected to automated three-dimensional analyses. Results will be correlated with clinical evaluations including coronary arteriography and the cardiopulmonary responses to exercise stress testing. Noninvasive methods for evaluating the circulatory responses (e.g. echocardiography) and the effect of drugs (e.g. propanalol) on the repolarization response to exercise will be utilized and correlated with the results of left ventricular angiography and coronary arteriography. This work was formerly documented under 7755-01-05.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0026, ESTABLISHMENT OF STANDARDIZED EXERCISE STRESS TESTS FOR DETECTION OF CORONARY ARTERY DISEASE IN AIRCREW MEMBERS

R.A. Wolthuis, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF321620)

The leading medical cause for removal of aircrew members from flying status is disease involving the circulatory system. This effort is to determine the value of exercise stress testing in the early detection of cardiopulmonary disease and in quantifying the

significance of such disease to the flyer, and to establish a standardized reliable exercise stress test that can be used in the field.

Aircrew members are studied during maximal exertion to provide better understanding of the normal/abnormal circulatory and electrocardiographic responses and the influence of disease and physical conditioning on these responses. Studies of exercise stress testing procedures and monitoring methods including automated ECG analysis as well as the development of better methods for measuring work performance will continue. This work was formerly documented under 7755-01-02.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, VECTORIZING TRANSONIC CODES FOR USE ON ADVANCED COMPUTERS

M.D. Vandyke, Stanford University, School of Engineering, Dept. of Aeronautics & Astronautics, *Stanford, California* 94305 (NCA 2-745909)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

7.0002, MATHEMATICAL MODELS OF MANNING UTILIZATION

S.E. Bowser, U.S. Dept. of Defense, Navy, Personnel Research & Development Center, *San Diego, California* 92152 (DN897512)

To develop and demonstrate a mathematical simulation model as an alternative to shipboard testing for evaluating the effects of variations in manning on operational performance of Navy ships and aircraft.

An existing large-scale ship simulation model, (ship II) and an analytic compilation of existing manpower models will be built upon. There will be six phases: (1) criteria for the manpower reduction model will be developed, (2) existing models will be analyzed to identify techniques and procedures which could be utilized and adapted, (3) the model will be designed, (4) needed data will be specified and collected, (5) the model will be tested to validate and demonstrate the adequacy and accuracy of its simulation, and (6) manpower reduction methods will be developed. The model will be used to demonstrate the effects of the various methods.

SUPPORTED BY U.S. Dept. of Defense, Navy, Personnel Research & Development Center

7.0003, JOINT USE OF RESOURCES FOR IMPROVED LANDSAT DATA PROCESSING CAPABILITY

R.J. Murray, Oregon State Higher Education System, Oregon State University, Computer Center, *126 Agriculture Hall, Corvallis, Oregon* 97331 (NCA 2-586901)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

7.0004, INVESTIGATION OF PORTABILITY TECHNIQUES FOR A LARGE FLIGHT-ORIENTED PROGRAMMING LANGUAGE

S. Feyock, College of William & Mary, Williamsburg College, School of Arts & Sciences, Dept. of Mathematics & Computer Science, *Ewell Hall, Williamsburg, Virginia* 23185 (NSG 1626)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, NUMERICAL SIMULATION OF THE TURBULENT CASCADE AND VOLTAGE AMPLIFICATION MECHANISM IN THE MAGNETOSPHERE

O.W. Swift, University of Alaska, Fairbanks Campus, Geophysical Inst., *Fairbanks, Alaska* 99701 (NSG 7625)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

8.0002, LABORATORY INFRARED REFLECTANCE STUDIES

Unknown, University of Arizona, Graduate School, *Tucson, Arizona* 85721 (NSG 7607)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Headquarters

8.0003, LASER SPECTROSCOPY AND COLLISION STUDIES OF MOLECULAR IONS

W.H. Wing, University of Arizona, School of Liberal Arts, Dept. of Physics, *Tucson, Arizona* 85721 (10233-AC6)

This proposal concerns high-precision spectroscopy of vibration-rotational frequencies of molecular ions, employing a novel ion beam-infrared laser resonance method which has recently produced the first observed infrared spectrum of the hydrogen molecular ion, nature's simplest molecule. This result has opened the possibility of a wide range of molecular ion studies producing highly accurate and detailed measurements both of internal structure and of collision cross-sections of molecular ions in individual vibrational states. Such spectroscopic data are at present nonexistent for most molecular ions except from estimates or theoretical predictions. Similarly most measured cross-sections are averages over internal-state distributions.

If successful, the program would establish energy levels of molecular ions to at least the precision with which levels of neutral molecules are now known. Thus the results will be of great importance to quantum chemistry, molecular theory, astrophysics, and the description of high-temperature gaseous and plasma processes.

SUPPORTED BY American Chemical Society

8.0004, STUDIES ON LASERS AND LASER DEVICES

S.E. Harris, Stanford University, School of Engineering, Dept. of Electrical Engineering, *Stanford, California* 94305 (NSG 7619)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Aeronautics & Space Technology

8.0005, THEORETICAL SOLID STATE PHYSICS

M. Cohen, University of California, Berkeley Campus, Lawrence Berkeley Lab., *Berkeley, California* 94720

Theoretical analyses aided by computer calculations are used to explain existing experimental phenomena and to predict new properties of materials such as surface states on clean semiconductors; electrons at steps; vacancies and adsorbates on semiconductors; microscopic theory of metal-semiconductor interfaces (Schottky barriers); electronic structure of transition metal surfaces; bulk electronic and optical properties of solids; and superconducting transition temperatures for arbitrary electron-lattice coupling. (ERDA-77-123)

SUPPORTED BY U.S. Dept. of Energy, Div. of Basic Energy Sciences

8.0006, IMPROVEMENT OF THE ELECTRON-PHONON INTERACTION AS A FINAL MAJOR STEP FOR CALCULATING THE SUPERCONDUCTING TRANSITION TEMPERATURE IN NIOBIUM

C.Y. Fong, University of California, Davis Campus, School of Letters & Science, Dept. of Physics, *Davis, California* 95616 (NSG 2383)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

8.0007, BEAM-PLASMA INTERACTIONS IN A LARGE LABORATORY PLASMA
R.L. Stenzel, University of California, Los Angeles Campus, School of Letters & Science, Dept. of Physics, *405 Hilgard Ave., Los Angeles, California* 90024 (NSG 7616)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

8.0008, SURVEILLANCE AND COMMUNICATION - SUPERCONDUCTING SEMICONDUCTOR DEVICES
H. Suhl, University of California, San Diego Campus, Graduate School, Dept. of Physics, *P.O. Box 109, La Jolla, California* 92037 (DN875260; N00014-78-C-0029)

The contract shall study the properties of planar Josephson junctions fabricated on semiconductor substrates. The resultant new class of superconducting devices is of direct interest to the Navy for use in its communication, signal processing and ASW systems.

Magnetoresistance and Hall-type measurements will be performed on P-InAs to determine electron density, mobility and the width of the N-type surface layer. Characterization of the 'free' surface and the surface under the superconducting electrodes will be attempted. Initially the penetration of the superconducting order parameter of a lead contact into an inverted surface region in P-type InAs will be investigated. Among the parameters to be varied are the thickness and carrier concentration in the inverted region. Effects of temperature and magnetic field will also be explored.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0009, ELECTROOPTIC BEAM DEFLECTOR
T. Litovitz, Catholic University of America, School of Arts & Sciences, Dept. of Physics, *620 Michigan Ave. N.E., Washington, District of Columbia* 20017 (DN780286)

To investigate thin film optical beam deflectors for use in high speed optical A/D converters. Several approaches to thin film beam deflection have been demonstrated to date. The best of these approaches using electrooptic prism arrays will be investigated and designed for optimum performance. Emphasis will be placed on the reduction of beam distortion, and the suppression of sidelobes in order to obtain the maximum number of resolvable spots. The design will also be optimized for GHZ deflection speeds and will be incorporated into a miniaturized optical system to separate the beams. The Navy has a continuing requirement for new and/or improved device performance for use in signal-processing applications.

The various approaches to optical beam deflection in thin films will be investigated and the optimum design will be chosen. Theoretical analysis will be performed to determine the best electrode configuration from the point of view of speed, beam distortion and sidelobe suppression. Several devices will be fabricated and tested. Efforts to incorporate the deflector into a microoptic circuit will also be undertaken.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

8.0010, MOLECULAR RADIATION PHYSICS--FUNDAMENTAL RADIATION PHYSICS AND CHEMISTRY AGENCY
J.L. Dehmer, U.S. Dept. of Energy, Argonne National Lab., *9700 S. Cass Ave., Argonne, Illinois* 60439 (ANL 67100; ERDA RK-02-04-02)

This research is directed principally toward detailed understanding of the primary and secondary events in the interaction of ionizing radiations with matter. These early events are equally relevant to physical, chemical, and biological action of radiations. The methods are entirely theoretical, but utilize a great deal of experimental information. One important task of this research is to coordinate experimental efforts of the Fundamental Molecular Physics and Chemistry section through theoretical interpretation and analysis.

SUPPORTED BY U.S. Dept. of Energy

8.0011, MICROSCOPIC THEORY OF NUCLEI, NUCLEAR, AND NEUTRON STAR MATTER
V.R. Pandharipande, University of Illinois, Urbana Champaign Campus, School of Liberal Arts & Sciences, Dept. of Physics, *Urbana, Illinois* 61801 (PHY7826582)

This proposal is in the field of theoretical physics, with emphasis on studies of properties of nuclear matter and of quantum fluids. Specific topics to be examined include: A. Theory of simple quantum fluids like helium liquids, electron gas, etc., in which the two-body interaction is a spherically symmetric function of the interparticle distance. B. Variational theory of nuclear and neutron-star matter: The main interest here is to develop theories to treat the important spin, isospin, tensor and spin-orbit correlations in these fluids. C. A study of nucleon-nucleon interaction models which are the essential ingredients for a microscopic theory of dense matter. D. A study of possible phases of matter at super-nuclear densities, particularly pion condensates and quark matter. E. Calculation of neutron-star models and their observable properties. F. Microscopic calculations of the structure of finite nuclei.

First of a 3-year continuing grant, renewal of PHy76-22147AO2.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0012, SUPERCONDUCTIVITY
K.A. Gschneidner, U.S. Dept. of Energy, Ames Lab., *Ames, Iowa* 50010

Low-temperature, high-magnetic field heat capacity studies are made of 4f-type superconductors, La3In, La0S2 and La3S4. Preparation of superconducting composite materials by directional solidification is studied. (ERDA-77-123)

SUPPORTED BY U.S. Dept. of Energy, Div. of Basic Energy Sciences

8.0013, INVESTIGATION OF CHARGED PARTICLE ACCELERATION MECHANISMS IN SPACE PLASMAS
G.R. Joyce, University of Iowa, School of Liberal Arts, Dept. of Physics & Astronomy, *Jessup Hall, Iowa City, Iowa* 52240 (NSG 7632)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

8.0014, RADIO-FREQUENCY SIZE EFFECT MEASUREMENTS IN METALS
R.G. Goodrich, Louisiana State University, Agricultural & Mechanical College, Graduate School, Dept. of Physics & Astronomy, *University Station, Baton Rouge, Louisiana* 70803 (DMR7681866A02)

The research program of radio-frequency size effect measurements in high purity metals and the calculations necessary to interpret the measurements which previously were supported by NSF grant DMR73-02427AO2 will be continued. This research program has three parts: The Fermi surfaces of rhenium and other metals will be accurately determined; relaxation processes involving the electronic carriers in gold, silver and in other metals will be investigated; and detailed computer calculations will be performed to aid in the interpretation of the measurements.

This is the lst year of a 3-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0015, ELECTRICAL NATURE OF DISLOCATIONS IN SEMICONDUCTORS
J.S. Ahearn, Martin Marietta Corp., Martin Marietta Laboratories, *1450 S. Rolling Rd., Baltimore, Maryland* 21227 (DMR78-05717)

This project will be a study to determine the nature of the defect state that is introduced into semiconducting materials by dislocations. It is known that dislocations degrade the performance and reliability of semiconductor devices. The objective will be to understand the mechanisms whereby this performance degradation occurs.

Materials to be studied will include single crystals of silicon and zinc oxide, which is a wide band gap semiconductor. The semiconductor will be the working electrode of an electrolyte cell. The charge residing in the dislocation level(s), other defect levels, the conduction band, and the valence band will be altered by changing the cell potential. The effects of altering the charge on these levels will be detected by current-potential, capacitance-potential, and dislocation velocity measurements.

Dislocations will be introduced by deformation, transmission electron microscopy will establish the dislocation density and type, and stress pulse techniques and etch-pitting will be used to determine dislocation velocities.

This research is a continuation of studies initiated under NSF Grant DMR75-05443 A03.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0016, INFRARED NONLINEAR OPTICS IN SEMICONDUCTORS

P.A. Wolff, Massachusetts Inst. of Technology, School of Science, Dept. of Physics, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (DF041830; AFOSR-76-2894)

AF function - secure space communications and covert optical electronics require devices which exploit special properties and interactions of materials with far infrared radiation. Opportunity -infrared materials research has a high potential impact on novel detectors, sources and communications for airborne and spaceborne applications. Objective - this effort combines theory and experiment to investigate a variety of infrared nonlinear optical energy transfer processes in narrow band-gap semiconductors for generating coherent far infrared tunable sources of radiation. How work contributes - these interactions and unique phenomena should provide a basis for developing useful tunable, infrared sources for communications and radars and diagnostics of rocket plumes and exhausts.

The following nonlinear processes involving mobile and weakly-bound electrons in semiconductors are being studied: stimulated impurity RAMAN scattering in N-Ge and N-Si, resonant, field-induced nonlinearities due to impurities, radiation from parametrically-excited plasma waves, resonant, spin-flip scattering in InSb and (Cd,Hg)Te, stimulated, far infrared spin flip scattering, resonant, spin-induced difference frequency generation, stimulated, bulk plasma-wave scattering, and side-band generation via spin precession. These theoretical and experimental studies should yield new insights concerning electron dynamics in semiconductors and the probable generation of coherent, far infrared sources of radiation.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0017, LOCAL FIELD EFFECTS AND THE OPTICAL PROPERTIES OF INSULATORS

D.L. Johnson, Northeastern University, Graduate School, Dept. of Physics, *360 Huntington Ave., Boston, Massachusetts* 02115 (DMR78-12001)

The optical properties of solids are conventionally analyzed under the assumption that the polarizable valence charge density is homogeneous on a microscopic scale - the justification being that the wavelength of light is much larger than the interatomic distances and so the latter fluctuations average out as far as the former is concerned. The extent to which this is not a valid assumption is called the local field effect. This research will carry out a plan for theoretically calculating the local field effect in insulators by means of relatively simple models with no adjustable parameters. The most significant successful experiment bearing directly on local field of refraction for light propagating in a low symmetry direction actually depends slightly on the direction of polarization of the light. This is because the cubic symmetry of the crystal is lower than isotropic symmetry; the effect is absent in an assumed isotropic dielectric, likewise for propagation in high symmetry directions. There is at present no quantum mechanical theory of this effect and it is one of the principal aims of this research to calculate it.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0018, OPTICAL CONSTANTS OF TRANSITION METALS

R.W. Christy, Dartmouth College, School of Arts & Sciences, Dept. of Physics & Astronomy, *P.O. Box 833, Hanover, New Hampshire* 03755 (NSG 2397)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

8.0019, EFFECTS OF LARGE AMPLITUDE ION ACOUSTIC WAVES ON THE BEAM PLASMA INSTABILITY

J. Walsh, Dartmouth College, School of Arts & Sciences, Dept. of Physics, *P.O. Box 833, Hanover, New Hampshire 03755* (DF049590; AFOSR-77-3410)

AF function - operation of high altitude vehicles in a post nuclear explosion environment, development of electromagnetic weapons, space and ionospheric communications as well as countermeasures demand advanced equipment unavailable to date. Deficiency - present day information is inadequate to design the aforementioned equipment. Such information may be obtained from experimental and theoretical work on beam-plasma nonlinear interactions. Objective - this project will investigate the effects of large amplitude ion acoustic waves on the beam-plasma instability. Contribution - this work is a part of a comprehensive program on plasma research for the development of an x-ray radiation source for simulation of nuclear weapon effects, the development of advanced electromagnetic weapons (laser and ion beam), the development of space and ionospheric communications and the development of countermeasures.

This project will perform experimental and theoretical research on two beams - a. A fast electron beam which is propagated in a plasma containing large amplitude short wavelength ion acoustic waves. In this experiment the following processes appear: 1. The beam drives a long wavelength plasma wave unstable. 2. This wave couples its energy strongly to a much shorter wavelength plasma wave. The main objective is to isolate the effect of the large amplitude ion acoustic wave upon the beam-plasma processes of interaction of the relativistic beam with a plasma specifically the generation of microwave radiation. This may be accomplished by 1. Stimulated Cerenkov radiation of which considerable evidence exists and 2. Stimulated Raman-Cerenkov radiation of which there is no experimental evidence. To accomplish the foregoing they will explore - 1. The capability of the basic stimulated Cerenkov oscillator-amplifier. 2. The possibility of driving coupled dielectric resonators and other dielectric structures and 3. The characteristics of various stimulated Raman-Cerenkov sources.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0020, EXPERIMENTS ON SUPERFLUID HELIUM THREE AND DISORDERED SOLIDS

K. Deconde, Princeton University, Graduate School, Dept. of Physics, *205 Nassau Hall, Princeton, New Jersey* 08540 (DMR7904141)

This research is a continuation of work initiated under NSF Grant No. DMR77-10636. A newly established ultra-low temperature facility will be used in an experimental program involving two diverse areas of low temperature physics. A helium-3, helium-4 dilution refrigerator, capable of producing temperatures as low as 0.013K, will be used in a study of the low temperature thermal, magnetic and transport properties of disordered solids. Of particular interest are systems of dilute, randomly positioned, dipolar impurities in a host solid. It has been suggested that the low temperature properties of such systems should obey predictions based on a two-level tunneling model. In order to test this suggestion, measurements of the ultrasonic attenuation of doped

crystalline solids and the time dependence of the dielectric constant of similarly doped glasses will be performed. Upon completion of a nuclear cooling stage capable of attaining temperatures as low as 0.0007K, a study of the spin-polarization properties of the A1 phase of superfluid helium-3 will be undertaken. Measurements of the direction of the spin-polarization, the spin-lattice relaxation times and the dependence of the superfluid transition temperature on the bulk polarization will be performed. This research is important for our fundamental knowledge of quantum fluids and solids--systems of prime importance to the low-temperature physics program.

First year of a two-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0021, RESEARCH STUDY ON THE EFFECTS OF RADIATION ON THE ELECTRICAL PROPERTIES OF INSULATOR MATERIALS IN MOS DEVICES (Z99QAXTA007-DNA)

G.W. Hughes, Radio Corp. of America, David Sarnoff Research Center, *Washington Rd., Princeton, New Jersey 08540* (DA0F5733; DAAG39-77-C-0159)

To investigate the nature of charge traps in SiO2 films (both dry and wet thermally grown) employed as the gate insulator in MOS devices as a function of changes in processing variables.

Charges generated by vacuum ultraviolet radiation and subsequently trapped near the gate and semiconductor interfaces will be studied both via tunnel injection currents induced by the trapped charge and by conventional C-V techniques.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Harry Diamond Lab.

8.0022, LASER-INDUCED LIGHTNING INVESTIGATION

C.B. Moore, New Mexico Inst. of Mining & Technology, Graduate School, Dept. of Physics, *Campus Station, Socorro, New Mexico 87801* (DF053590; AFOSR-78-3722)

AF function - aircraft, weapons stores and missiles are susceptible to direct or nearly direct lightning strikes. The AFFDL is the AF focal point for natural EMP. Deficiency - the inability of new composite materials to transfer lightning-induced charges and the increased susceptibility of flight control, avionics, and weapon guidance electronics due to the use of mini and microelectronics require a more complete knowledge of the frequency content and power levels of lightning. Objective - to test and analyze the use of a high-power laser system to enhance the probability of triggering a natural lightning discharge. Also to measure and diagnose the resultant lightning strikes. How work contributes - ground-based measurements would obviate the need for costly flight operations and overcome the space/weight limitations for receiver/diagnostic equipment and flight safety problems inherent in an aircraft test bed. Lightning location and time history will be better measured. The measured power level and frequency content will then be more knowledgeably modelled and understood.

The university investigators will supply the measurements of electric fields necessary for management of the laser discharge. The acoustics and video diagnostics of the lightning origins and path will also be provided by New Mexico Tech. The AFFDL will provide and operate the laser. Joint analysis of the triggering techniques and resultant lightning will be performed.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0023, BASIC RESEARCH ON THE ELECTROMAGNETIC SPECTRUM 14979-EL

W. Happer, Columbia University, School of Arts & Sciences, Dept. of Physics, *Broadway & W. 116th St., New York, New York* 10027 (DA0F9006; DAAG29 77 C 0019)

Research studies and investigations directed toward extending the useful range of the electromagnetic spectrum, in order to attain new fundamental knowledge to exploit the use of extremely short electromagnetic waves, extending the region of visible light and beyond.

Theoretical and experimental studies will be conducted in the following technologies - quantum electronics plus optics, electronic materials and gaseous electronics and antennas and microwave divices.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

8.0024, CHEMISORPTION AND CATALYSIS ON MODIFIED SINGLE CRYSTALS AND MICROPARTICLES OF TRANSITION METALS

T.N. Rhodin, Cornell University, Ithaca Campus, School of Engineering, Dept. of Engineering & Applied Physics, *242 Carpenter Hall, Ithaca, New York* 14853 (DMR7825261)

The long range goal of the present work is to understand the nature of the chemical bonding of atoms and molecules absorbed on surfaces. Such studies underlie better understanding of the performance of catalytic and related materials.

Experimental methods include programmed thermal desorption spectroscopy, low energy electron diffraction (LEED), and Auger electron spectroscopy (AES). The principal method is vacuum ultraviolet and soft X-ray angle resolved photoemission spectroscopy. Some of the measurements require the wide spectral range of intense polarized light available at the Stoughton, Wisconsin, synchrotron light source. Diffraction of photoelectrons by the ordered overlayers is explored as a possible new tool for surface crystallography. Systems chosen as model substrates are single crystal surfaces such as iron (110) and nickel (111). Absorbed species include atoms of oxygen, sulfur, selenium, and tellurium as well as molecules of carbon monoxide (CO) and ammonia (NH3). These particular substrates and adsorbates are related to catalytically important systems. As their surface coverages are increased, series of ordered overlayer structures are formed. The present work is directed toward understanding the adsorbate-substrate and adsorbate-adsorbate interactions that give rise to these structures.

This is a continuation of work supported by DMR 77-05078.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0025, COMMUNICATIONS - VARIATIONAL TECHNIQUES FOR COMPUTATION OF ATOMIC PROCESSES

L. Spruch, New York University, Washington Square & University College of Arts & Sciences, Dept. of Physics, *421 1st Ave., New York, New York* 10012 (DN823378; N00014-76-C-0317)

The objective of this work is to construct theoretical variational expressions for the computation of cross-sections for atomic processes and expectation values of certain atomic operators. These would permit very precise computation of the relevant atomic processes. These atomic processes and atomic properties are important to the Navy since they occur in such systems as lasers, the atmosphere, gaseous electronic devices, etc., which are important to naval communications and surveillance.

A newly-derived variational principle for scattering lengths is being tested for scattering of positrons by hydrogen atoms. Previously derived extremum principles for the calculation of multiphoton ionization probabilities are being generalized to take into account the effect of a stong radiation field on the continuum states. Power series expansions in inverse powers of the magnitude of the wave vector are being derived for generalized oscillator strengths and charge transfer collisions.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0026, ACOUSTIC WAVE EVALUATION OF SEMICONDUCTORS

P.K. Das, Rensselaer Polytechnic Inst., School of Engineering, Dept. of Electrical Engineering, *110 8th St., Troy, New York* 12181 (DF049830; AFOSR-77-3426)

AF function - solid state microwave devices are essential components of Air Force command, control, communications and surveillance systems. Opportunity - methods for non-destruc-

tive testing microwave materials are presently inadequate. Objective s it is the objective of this research to develop and to perform non-destructive evaluation of 3-5 semiconductor materials using surface acoustic wave techniques. How work contributes - this research should provide a method to use routinely in testing non-destructively electronic materials after each step in device fabrication.

The interaction of acoustic surface waves in a piezoelectric substrate in the proximity of semiconductor charge carriers will be utilized to determine trap locations, surface and interface states, bulk and surface conductivity and mobility, and trap lifetimes by studying the attenuated output, and transverse acoustic-electric voltage in the presence of applied DC bias and different light wavelengths illuminating the semiconductor.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0027, EXPERIMENTAL RESEARCH - SUPERCONDUCTIVITY

M. Strongin, U.S. Dept. of Energy, Brookhaven National Lab., *Upton, New York* 11973

The following subjects are being studied: superconductivity in A-15 films; normal-state resistivity of Nb3Ge and Nb3Sn films; effects of alpha-particle and electron irradiation on the transition temperature and density of states; code-position of elements to study metastable phases in alloy films; and hydrogen in amorphous silicon films. (ERDA-77-123)

SUPPORTED BY U.S. Dept. of Energy, Div. of Basic Energy Sciences

8.0028, PROPERTIES OF FLUID HELIUM NEAR CRITICAL POINT

H. Meyer, Duke University, Trinity College of Arts & Sciences, Dept. of Physics, *Durham, North Carolina* 27706 (DF046080; AFOSR-77-3119)

AF function - this proposed research primarily falls in the 5.3 research objectives which deal with electrical power for manned and unmanned aircraft, satellites and space stations as well as electrical power for unattended ground based systems. Research is required in the generation of usable electric power from nonnuclear energy sources, distribution and conditioning of the power and the attendant material requirements. The development of superconductive rotating electrical power generators and pulsed superconductive energy storage systems require that these systems be kept below their normal transition temperature. Deficiency - research is needed in making more efficient heat transport helium systems. As an example of the need, over 90 percent of the system weight of a superconductive energy storage system results from the cryogenic coolant and its storage container. This causes severe weight, volume and reliability penalties in the helium refrigeration systems. It does not appear that high temperature superconductors (TC 25 degrees K) will be developed. Objective - the program is based on high resolution dielectric constant measurements from which the PI can determine very sensitively the changes in the dielectric constant and also changes in the number density in the fluid with temperature and as a function of height in the cell. These results are used to obtain values of thermodynamic parameters of liquid helium (3) and (4) mixtures near the critical point. Contribution - this research is a part of a comprehensive program in superfluids and superconductors.

High resolution dielectric constant measurements are made to investigate thermodynamic characteristics of He(3) and He(4) mixtures near the critical point. More specifically the concentration susceptibility for a mixture ratio of .8 will be measured near the liquid vapor critical point and compared with theory. In addition the thermal diffusivity ratio, thermal conductivity and mass diffusion coefficient will be measured for concentrated mixtures near the superfluid transition. These measurements will be interesting since renormalization group theory and scaling theory predict differing behaviors.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0029, EVALUATION OF TURBULENCE-INDUCED NOISE IN COHERENT ANTI-STOKES RAMAN SCATTERING

R.A. Elliott, Oregon Graduate Center, Graduate School, *19600 N.W. Walker Rd., Beaverton, Oregon* 97005 (NSG 2387)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

8.0030, COMMUNICATIONS - ATOMIC AND MOLECULAR INTERACTIONS

R.M. Herman, Pennsylvania State University, University Park Campus, School of Science, Dept. of Physics, *211 Whitmore Lab., University Park, Pennsylvania* 16802 (DN723885; N00014-75-C-0741)

Optical communications are of interest to the Navy. The objective of this work is to examine some of the problems assoicated with optical frequency standards in atomic systems.

The approach used will be to theoretically study the effects of pressure on quantum beat spectroscopy and to arrive at an understanding of how intraatomic coherence may be destroyed or transferred in atomic collisions following sudden excitation. The theoretical techniques used will be the resolvent operator and density matrix formalism of quantum mechanics and the radiation field will be treated quantum electrodynamically. The results of this study are expected to provide new information on processes affecting precision spectroscopic studies of atomic systems on the interatomic forces affecting various excited state atomic properties, and on spin exchange processes in excited atomic systems. Of special interest is the newly discovered phenomenon of collisional transfer of quantum beats to transitions in which none would be allowd in the absence of collisions.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0031, ATOMIC COLLISIONS AND PLASMA PHYSICS *15740-P*

M.A. Biondi, University of Pittsburgh, School of Arts & Sciences, Dept. of Physics, *4200 5th Ave., Pittsburgh, Pennsylvania* 15260 (DA0F9142; DAAG29-78-G-0044)

To study atomic collisions related to the upper atmosphere. This research provides basic information for ballistic missile defense systems, and has the potential for contributing parameters for studies of laser propagation in the atmosphere.

Experimental investigations of ion-molecule reactions and electron-ion recombination under conditions, and for species, of interest to DNA.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

8.0032, APPLICATION OF POSITION-SENSITIVE DETECTION TO CYLINDRICALLY SYMMETRIC CHARGED-PARTICLE SPECTROMETERS

I. Sellin, University of Tennessee, Knoxville Campus, School of Liberal Arts, Dept. of Physics & Astronomy, *W. Cumberland Ave. S.W., Knoxville, Tennessee* 37916 (PHY7820339)

This project will develop new detectors of atomic fragments, which will find use in detecting the reaction products from atom-atom interactions or the scattering of atoms from surfaces. Alternate schemes for carrying out two-dimensional position analysis of charged particle distributions at the exit of several cylindrically-symmetric spectrometers will be evaluated, and the most attractive scheme for use in basic physics experiments implemented. Basic research will benefit by making such low gathering-power, high-resolution, dispersive devices significantly more useful by virtue of multiplying data acquisition rates in short runs at major accelerator facilities (where time is tightly scheduled and expensive) by factors greater than 50. Because similar charged particle spectrometers have come into wide use as analytical tools for surface and chemical analysis in broad areas of materials science (for example, metallurgy), chemistry (for example surface catalysis), and applied physics (for example, chemical analysis of atmospheric gases), there will be significant impact of this research of several other technologies.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0033, MATERIAL SUPPORT TECHNOLOGY - INVESTIGATION OF OPTICAL BIASING ON THE QUANTUM TRANSPORT PROPERTIES OF SEMICONDUCTORS
D.G. Seiler, North Texas State University, School of Arts & Sciences, Dept. of Physics, *N. Texas Station, Box 13707, Denton, Texas* 76203 (DN675241; N00014-76-C-0319)

To investigate transient and non-equilibrium effects in quantum transport properties of electrons and holes in semiconductors that find application in naval electronic systems.

The investigation will study the quantum transport of electrons and holes generated by optical irradiation in the presence of high electric and magnetic fields. During this study, new tools will be developed and utilized to provide information on determination of the non-equilibrium electron temperature and the effect of laser irradiation upon this temperature, to determine the transient effects of the Shubnikov-de Haas and magnetophonon resonance effects in pulsed electric fields and the corresponding energy relaxation times, and to study the properties of the non-equilibrium carriers through spin-splitting of the Shubnikov-de Haas effect.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0034, MATRIX ISOLATION STUDIES OF BIMETALLIC CLUSTERS
P.A. Montano, West Virginia University, School of Arts & Sciences, Dept. of Physics, *Morgantown, West Virginia* 26506 (DMR7611113A01)

The study of metal clusters isolated in rare gas matrices using optical spectroscopy and electron spin resonance has opened a new area of research with long-range applications to areas such as nucleation, and heterogeneous catalysis. In the present, Mossbauer spectroscopy will be used to study matrix-isolated bimetallic clusters. This technique will help elucidate many of these clusters' properties, not measurable by other methods. Moreover, extended X-ray absorbtion fine structure (EXAFS) will be used to determine the interatomic distances for the matrix-isolated bimetallic molecules.

Simple bimetallic clusters of iron with Pt, Cr, Ti, and Ag are studied using Mossbauer spectroscopy and EXAFS. In this work the interest is in characterizing the molecules, finding their ground electronic properties of metal-metal bonds.

A study of the reactions of simple gases like CO, N2, CH4 with FeCu and FePt bimetallic clusters also will be undertaken.

This is a continuation of work supported by DMR76-11113.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0035, POLYMER SURFACE COATINGS FOR DOWNCONVERSION OF UV RADIATION AND INHIBITION
W.M. Yen, University of Wisconsin, Madison Campus, School of Letters & Science, Dept. of Physics, *500 Lincoln Dr., Madison, Wisconsin* 53706

This project focuses on the development and optical evaluation of surface coatings on polymeric substrates which will downconvert the UV component of solar radiation into the visible region and will simultaneously inhibit photodegradation of the plastic glazings. Coatings will be developed to adhere lanthanide trivalent ions on plastic substrates. They will then be tested, evaluated and compared to the optical and mechanical properties of coated systems. Solarization testing and development of an experimental methodology to assay the absolute and relative performance will also be performed. Cost-effectiveness analyses with the purpose of settling on optimum coatant, coating method and substrate will follow. Finally, a scale-up of the coating operation to commercial scale will be investigated. This project is under negotiation. (DOE/CS-0010)

SUPPORTED BY U.S. Dept. of Energy, Office of Conservation & Solar Applications, Div. of Solar Applications

SOCIAL SCIENCES

Includes Social Sciences (general); Administration and Management; Documentation and Information Science; Economics and Cost Analysis; Law and Political Science; and Urban Technology and Transportation.

9.0001, THE ANNOYANCE OF IMPULSIVE HELICOPTER NOISE
K. Karamcheti, Stanford University, School of Engineering, Dept. of Aeronautics & Astronautics, *Stanford, California* 94305 (NSG 2393)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, STUDIES OF PLANETARY EXTENDED ATMOSPHERES
R.A. Brown, University of Arizona, Graduate School, *Tucson, Arizona* 85721 (NSG 7634)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

10.0002, STUDY OF THE HOTTEST WHITE DWARFS FROM THE PALOMER–GREEN SURVEY
R.F. Green, California Inst. of Technology, Graduate School, *1201 E. California Blvd., Pasadena, California* 91109 (NSG 5385)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0003, SUPPORT OF RESEARCH INVOLVING INTERNATIONAL ULTRAVIOLET EXPERIMENT (IUE) SATELLITE
J.L. Greenstein, California Inst. of Technology, Graduate School, Dept. of Physics Mathematics & Astronomy, *1201 E. California Blvd., Pasadena, California* 91109 (NSG 5181)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0004, ULTRAVIOLET OBSERVATIONS OF YOUNG STELLAR POPULATIONS
D.L. Meier, California Inst. of Technology, Graduate School, *1201 E. California Blvd., Pasadena, California* 91109 (NSG 5384)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0005, RESEARCH OF INTERSTELLAR LINES IN THE GALACTIC HALO
W.L. Sargent, California Inst. of Technology, Graduate School, Dept. of Astronomy, *1201 E. California Blvd., Pasadena, California* 91109 (NSG 5369)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0006, ULTRAVIOLET OBSERVATIONS OF STARS - A COSMOLOGICAL COMPARISON
H. Spinrad, University of California, Berkeley Campus, School of Letters & Science, Dept. of Astronomy, *Berkeley, California* 94720 (NSG 5360)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0007, THE ACCRETION OF MASS ONTO COMPACT STELLAR OBJECTS

J.I. Katz, University of California, Los Angeles Campus, Inst. of Geophysics & Planetary Physics, 405 Hilgard Ave., Los Angeles, California 90024 (AST7815431)

This project will involve research on the accretion of mass onto compact stellar objects such as white dwarf or neutron stars. The problems will deal with the consequences of mass accretion and the conditions under which accretion can take place. Three specific problems will be analyzed: (1) There will be a calculation of the rate of accretion onto a compact stellar object moving through an inhomogeneous medium. (2) There will be a calculation of mass loss from a star in a close passage by a compact object and of accretion onto that object. (3) There will be development of improved techniques of data analysis for searching for a secondary spectrum (of another star) in a single-lined spectroscopic binary.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0008, OBSERVATIONS OF INTERSTELLAR ZINC

M.A. Jura, University of California, Los Angeles Campus, School of Letters & Science, Dept. of Astronomy, *405 Hilgard Ave., Los Angeles, California 90024 (NSG 5377)*

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0009, STUDIES OF CIRCUMSTELLAR AND INTERSTELLAR GRAINS

M.A. Jura, University of California, Los Angeles Campus, School of Letters & Science, Dept. of Astronomy, *405 Hilgard Ave., Los Angeles, California 90024 (NSG 7621)*

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

10.0010, THEORETICAL LYMAN-ALPHA AND BALMER-ALPHA SPECTRA FOR PUBLISHED CHROMOSPHERIC FLARE MODELS

R.C. Canfield, University of California, San Diego Campus, Graduate School, *P.O. Box 109, La Jolla, California 92037 (DF044440; AFOSR-76-3071)*

AF function - Air Force communications and spacecraft operations are affected by disruption in near-earth space produced by solar flares. Deficiency - improved prediction of solar flares is required. Objective - to understand the physical processes taking place on the sun during solar flares. Contribution - understanding the physical conditions in solar flares is a necessary condition to improving their prediction.

Present theoretical models of the solar flare atmosphere will be tested by computing profiles of the hydrogen radiation and comparing them with observations. The radiation will include Lyman-alpha, Balmer-alpha and Lyman continuum. The specific objective is to determine whether the models are physically self-consistent and compatible with the observed flare radiation. Development of improved steady-state and dynamic flare models will be begun. Numerical calculations will use the previously-developed probabilistic radiation transfer code to treat optically thick regions like the chromosphere. The specific objective is to develop physically-consistent models of the solar flare over a temperature range of ten thousand to ten million degrees K.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

10.0011, ULTRAVIOLET SPECTROSCOPY OF TAURI STARS

G.H. Herbig, University of California, Santa Cruz Campus, Graduate School, Dept. of Astronomy & Astrophysics, *Santa Cruz, California 95060 (NSG 5361)*

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0012, INTERNATIONAL ULTRAVIOLET EXPERIMENT OBSERVATIONS OF MARS

A.L. Lane, University of Colorado, Denver Campus, Graduate School, *1100 14th St., Denver, Colorado 80202 (NSG 5394)*

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0013, GALACTIC EVOLUTION AND RELATED STUDIES

B.M. Tinsley, Yale University, Graduate School, Dept. of Astronomy, *206 Elm, New Haven, Connecticut 06520 (AST7723566A01)*

Theoretical research on the evolution of galaxies and related topics will be carried out. The major projects are studies of field galaxies as probes in cosmology, rates of star formation in normal and peculiar galaxies, and nucleochronologies as constraints on chemical evolution in the solar neighborhood. Specific projects will include a study of chemical evolution in collapse models for the formation of disk galaxies and detailed population models for elliptical galaxies. An analysis of the Hubble diagram and related cosmological parameters will be done taking into account recent theories of galactic evolution. Previous results will be extended in the context of new data and related theories.

This research is a continuation of grant AST-7723566.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0014, PHOSPHORUS IN COARSE-STRUCTURED IRON METEORITES

R.S. Clarke, Smithsonian Institution, Div of Meteorites, *1000 Jefferson Dr. S.W., Washington, District of Columbia 20560 (3370-49)*

The relationship of phosphide precipitation to the development of the Widmanstatten pattern in coarse-structured iron meteorites is under study. The distribution of nickel and phosphorus within Schreibersite and kamacite and taenite is being used as a tool in study of the cooling history of these meteorites.

SUPPORTED BY Smithsonian Institution, National Museum of Natural History

10.0015, NASA LOW-GRAVITY EXPERIMENTS

M.R. Moldover, U.S. Dept. of Commerce, National Bureau of Standards, Washington, District of Columbia 20228 (2214441)

PROJECT OBJECTIVE: To assist NASA in the development of experiments in which gravity plays a key role. These experiments will be prime candidates for inclusion in the unique zero gravity environment of the NASA space laboratory.

PROJECT APPROACH: Various potential experiments for studying phase transitions in a low-g environment are being analyzed. The quantitative effect of gravity on the measurements is being determined. Of these, those experiments which might best exploit the low gravity environment of an orbiting laboratory are being identified. Where appropriate, those experiments at earth gravity which are necessary for final selection of low-g experiments for the space laboratory, or which are necessary for establishing a baseline against which to compare future results in the space lab are being carried out in our laboratory.

PRIOR YEAR ACCOMPLISHMENTS: 10 microkelvin thermostats designed and fabricated. Thin cell for dielectric constant experiment designed.

SUPPORTED BY U.S. Dept. of Commerce, National Bureau of Standards

10.0016, OBSERVING COMPACT OBJECTS - WORKSHOP

D. Pines, University of Illinois, Urbana Champaign Campus, School of Liberal Arts & Sciences, Dept. of Physics, *Urbana, Illinois 61801 (NSG 7598)*

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

10.0017, STUDIES OF SUSPECTED HIGH CARBON ABUNDANCE PLANETARY NEBULAE
J.P. Harrington, University of Maryland, College Park Campus, Graduate School, Dept. of Physics & Astronomy, *College Park, Maryland* 20742 (NSG 5390)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0018, DEVELOPMENT OF COMPUTER MODELS FOR THE ANALYSIS OF ULTRAVIOLET AND OPTICAL STELLAR SPECTRA
L.W. Kamp, Boston University, School of Liberal Arts, Dept. of Astronomy, *755 Commonwealth Ave., Boston, Massachusetts* 02215 (NSG 5389)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0019, ULTRAVIOLET STUDIES OF ASTRONOMICAL SOURCES
A.K. Dupree, Harvard University, Cambridge Campus, School of Arts & Sciences, Dept. of Astronomy, *Cambridge Station, Cambridge, Massachusetts* 02138 (NSG 5370)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0020, INTERNATIONAL ULTRAVIOLET EXPERIMENT (IUE) OBSERVATIONS OF INTERSTELLAR CARBON
A.K. Dupree, Harvard University, Cambridge Campus, School of Arts & Sciences, Dept. of Astronomy, *Cambridge Station, Cambridge, Massachusetts* 02138 (NSG 5380)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0021, INVESTIGATION OF CARBON DIOXIDE ABSORPTION ON MARS AND VENUS
N.P. Carleton, Smithsonian Institution, Astrophysical Observatory, *60 Garden St., Cambridge, Massachusetts* 02138 (NGR 09-015-047)

High-resolution spectroscopy (with a Fabry-Perot spectrometer of the PEPSIOS type) of planetary absorption lines is being performed. This work is directed toward obtaining abundances and temperatures of various atmospheric constituents and toward understanding the distribution of clouds, on Venus and Jupiter in particular. The original scope of this work has been extended to include successful detection of oxygen and (possibly) ozone on Mars, a search for oxygen and water vapor on Venus, detection of HD on Jupiter, and a study of line formation in the atmospheres of Venus and Jupiter.

SUPPORTED BY Smithsonian Institution, Astrophysical Observatory

10.0022, A SEARCH FOR NEUTRINOS IN NATURE
E.L. Fireman, Smithsonian Institution, Astrophysical Observatory, *60 Garden St., Cambridge, Massachusetts* 02138 (450107)

One of the newest branches of astronomy is neutrino astrophysics -the study of neutrinos generated by celestial objects. Although neutrinos carry unique information that is unobtainable from other types of observations, attempts at their detection have heretofore been difficult and costly. SAO has developed and tested an inexpensive detector using potassium acetate and now proposes to continue measurements designed to determine the neutrino fluxes from various sources.

The present detector, which has been reliably operated under approximately 1000 feet of rock in the Hoosac Tunnel in Western Massachusetts for approximately 6 months, consists of 90 kilograms of potassium acetate. Limits for the neutrino and associated muon fluxes obtained with this detector are of scientific interest and were reported at the 13th International Cosmic Ray Conference on August 10, 1973; however, results of greater astrophysical significance should be obtainable with two 1000 kilogram potassium acetate units that are being constructed. One of these units will be installed at the Homestake Gold Mine in South Dakota and the other is planned for the Kolar Gold Mine in India.

SUPPORTED BY Smithsonian Institution, Office of Fellowships & Grants

10.0023, STELLAR SPECTROPHOTOMETRY
D.W. Latham, Smithsonian Institution, Astrophysical Observatory, Optical & Infrared Div, *60 Garden St., Cambridge, Massachusetts* 02138 (310-4050-08)

This is research in stellar spectroscopy. Part of it is medium-resolution high-accuracy spectrophotometry between 3200 and 10,800A, including a new absolute flux calibration of Vega. Part is high-resolution spectrophotometry using an echelle spectrograph. Recent efforts have centered on the microphotometry of echellograms and abundance analyses.

SUPPORTED BY Smithsonian Institution, Astrophysical Observatory

10.0024, CONTINUATION OF THE UTTAR PRADESH STATE OBSERVATORY/SMITHSONIAN ASTROPHYSICAL OBSERVING STATION AT NAINI TAL, INDIA
G.C. Weiffenbach, Smithsonian Institution, Astrophysical Observatory, *60 Garden St., Cambridge, Massachusetts* 02138 (FRS-46242)

SAO operates a network of astrophysical observing stations under NASA Satellite-Tracking Program Grant NGR 09-015-002 to track satellites in support of SAO and NASA research programs. The network has provided data for geodesy, geophysics and celestial mechanics since 1958. Observational data for comet and flare-star research have also been provided.

In geodesy and geophysics, the data are being used at SAO to develop accurate mathematical descriptions of the earth's size, shape, and gravity field. This information is fundamental to the understanding of the composition and structure of the earth. Models developed and published by SAO are used by investigators in geodesy and geophysics around the world as standard references. As a part of the NASA-sponsored Earth and Oceans Physics Applications Program (EOPAP), we are now embarking on a new program to measure the dynamic properties of the solid earth and the oceans.

Under this program, phenomena such as crustal and polar motion, earth and ocean tides, earth rotation, and ocean surface topography will be measured with satellite techniques to support research in earthquake mechanisms, earth crustal structure, ocean circulation, and the general air-sea interaction, which has a large influence on weather and climate.

In atmospheric research, the data are used to develop models of upper atmospheric densites, composition, and dynamic properties. These models are also used world-wide as standard references by investigators in atmospheric physics, solar physics, and the many areas in space science.

The data have revealed correlations between solar activity and satellite drag, caused by solar heating of the upper atmosphere, that show that atmospheric density variations are related to a number of separate but related solar phenomena.

Because of its worldwide distribution and unique optical equipment, the network has been able to support research in flare stars, comets, and other astronomical phenomena.

The station at Naini Tal, India, is one of the SAO network's 11 photographic observing sites. Because of its geographical location this station is a unique and valuable source of observational data for the global network. It has been operated in cooperation with the Uttar Pradesh State Observatory since 1958.

SUPPORTED BY Smithsonian Institution, Office of Fellowships & Grants

10.0025, AN INVESTIGATION OF HALOS SURROUNDING SPIRAL GALAXIES
D.J. Hegyi, University of Michigan, Ann Arbor Campus, School of Literature Science & the Arts, Dept. of Astronomy, *Ann Arbor, Michigan* 48104 (NSG 7608)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

10.0026, RESEARCH OF SUPERNOVA REMNANTS AND NUCLEOSYNTHESIS
R.P. Kirshner, University of Michigan, Ann Arbor Campus, School of Literature Science & the Arts, Dept. of Astronomy, *Ann Arbor, Michigan* 48104 (NSG 5366)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0027, ULTRAVIOLET SPECTROPHOTOMETRY OF CEPHEIDS
E.G. Schmidt, University of Nebraska, Lincoln Campus, School of Arts & Sciences, Dept. of Physics, *Lincoln, Nebraska* 68508 (NSG 5391)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0028, VELOCITY DISTRIBUTION OF INTERSTELLAR CLOUDS IN DISTANT SPIRAL ARMS AND IN MAGELLANIC CLOUDS
D.G. York, Princeton University, Graduate School, *205 Nassau Hall, Princeton, New Jersey* 08540 (NSG 5382)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0029, THEORETICAL STUDIES IN ASTROPHYSICS
S.L. Shapiro, Cornell University, Ithaca Campus, School of Arts & Sciences, Dept. of Astronomy, *Ithaca, New York* 14850 (AST7820708)

A number of topics in astrophysics will be investigated: (1) Stellar structure and evolution; (2) stars and their environments; (3) the interstellar medium; (4) globular clusters and galaxies, and (5) computational techniques applicable to astrophysical problems. In the area of stellar structure and evolution the formation of a compact object in a supernova explosion will be studied using fully relativistic numerical methods. There will be studies of accretion onto a neutron star in the presence of a magnetic field. The effect of planetary nebulae and supernovae on ionizing and heating the interstellar medium will be investigated theoretically and compared with radio observations of neutral hydrogen in the solar vicinity and in external galaxies. The dynamics of globular clusters which contain a massive central black hole will be studied. Star formation in galaxies, and the motion of gas in a galaxy will be examined. There will be numerical methods developed for the treatment of convection in stellar interiors.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0030, RESEARCH OF BINARY SYSTEMS AND COMPOSITE SOURCES INVOLVING COOL AND HOT COMPONENTS
R.F. Wing, Ohio State University, Columbus Campus, School of Arts & Sciences, Dept. of Astronomy, *190 N. Oval Dr., Columbus, Ohio* 43210 (NSG 5368)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0031, ULTRAVIOLET OBSERVATIONS OF VARIOUS TYPE SUPERGIANTS
N.D. Morrison, University of Toledo, Graduate School, *2801 W. Bancroft St., Toledo, Ohio* 43606 (NSG 5359)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0032, ULTRAVIOLET OBSERVATIONS OF HOT WHITE DWARFS IN BINARY SYSTEMS
E.M. Sion, Villanova University, School of Liberal Arts & Sciences, Dept. of Astronomy, *Villanova, Pennsylvania* 19085 (NSG 5375)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0033, OBSERVATIONS OF THE ULTRAVIOLET SPECTRA OF MAGELLANIC CLOUDS
R.J. Dufour, Rice University, School of Natural Sciences, Dept. of Space Physics & Astronomy, *6100 Main, Houston, Texas* 77001 (NSG 5364)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0034, ULTRAVIOLET-OPTICAL SPECTROPHOTOMETRY OF INTERESTING QUASI-STELLAR OBJECTS
B.J. Wills, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Astronomy, *200 W. 21st St., Austin, Texas* 78712 (NSG 5387)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0035, PHOTOMETRIC AND SPECTROGRAPHIC INVESTIGATIONS OF DWARF CEPHEID STARS
D.H. McNamara, Brigham Young University, School of Engineering Science & Technology, Dept. of Physics, *B-166 A S B, Provo, Utah* 84601 (AST78-17954)

This project will provide support for studies of a class of variable stars known as Cepheids. Photometric observations will be obtained of (1) classical Cepheid stars in our galaxy and in the large and small magellanic clouds, and (2) double-mode Cepheid stars in the galaxy.

1. Intermediate-band photometry will be secured of Cepheids in the large magellanic cloud to determine differences in the chemical composition of Cepheids in the clouds as compared with Cepheids in the solar environment. The new magnitude data on the Cepheids will also be utilized to redetermine the period-luminosity relations in the large and small magellanic clouds to see if they differ and are functions of the chemical composition.

Classical Cepheids in the direction of the galactic center and anticenter will be studied in order to determine the variation of heavy element abundances as a function of distance from the galactic center.

The heavy-element-abundance determined from observations of Cepheids in the small magellanic cloud and large magellanic cloud and galaxy will be correlated with the mean period of the variables.

2. Photometry of the double-mode Cepheids should yield surface temperatures, relative surface gravity values, and metal abundances of each variable. This investigation should provide an observational framework to test the theoretical interpretations of these stars.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0036, OBSERVATION OF CIRCUMSTELLAR SHELLS AROUND COOL GIANTS AND SUPERGIANTS
M. Kafatos, George Mason University, School of Arts & Sciences, Dept. of Astronomy, *400 University Dr., Fairfax, Virginia* 22030 (NSG 5371)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0037, OBSERVATIONS OF PLANETARY NEBULA SHELLS AND CENTRAL STARS
J.H. Lutz, Washington State University, School of Arts & Sciences, Dept. of Pure & Applied Mathematics, *Administration Bldg., Room 101, Pullman, Washington* 99163 (NSG 5383)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0038, STUDIES OF THE ULTRAVIOLET SPECTRA OF ASTRONOMICAL SOURCES
J.P. Cassinelli, University of Wisconsin, Madison Campus, School of Letters & Science, Dept. of Astronomy, *500 Lincoln Dr., Madison, Wisconsin* 53706 (NSG 5363)

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Scientific and Technical Aerospace Reports

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01 AERONAUTICS (GENERAL)

N80-10001 Allerton Press, Inc., New York, N. Y.
SOVIET AERONAUTICS, VOLUME 21, NO. 3
A. V. Talantov, ed., A. I. Bogomolov, ed., B. S. Vinogradov, ed., and A. F. Gurov, ed. 1978 132 p refs Transl. into ENGLISH from Izv. Uyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 5-167
Copyright. Avail: Allerton Press, Inc., 150 Fifth Ave., N.Y. 10011; $45.00

Factors related to the efficient operation of axial flow turbines and gas turbine engines are examined. Topics cover gas dynamics, flow distribution, jet mixing flow, heat transfer, turbulent diffusion, thermal protection materials, film cooling, and liquid bearings. For individual titles, see N80-10002 through N80-10030.

N80-10002 Allerton Press, Inc., New York, N. Y.
APPLICATION OF THE GAS FLOW DIMENSIONLESS CHARACTERISTICS METHOD FOR EXPERIMENTAL STUDY OF SONIC NOZZLES c02
G. V. Abalakov, B. S. Vinogradov, and A. P. Gerasimov *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 1-5 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 5-11 (For primary document see N80-10001 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Ave., N.Y. 10011; $45.00

A technique for quantitative description of gasdynamic flows requires measurement of the parameters at two sections: the initial section and the section being studied. Any channel section with area equal to the actual geometric section area or an arbitrarily adopted area can be used as the initial section. Each parameter at the initial section is measured only at those points at which the sensing element of the corresponding measuring instruments are installed permanently and invariably. The distribution of the parameters are measured over the area of the subject section. The correctness of the method is demonstrated experimentally in a study of the gasdynamic characteristics of a sonic nozzle. The principle governing the determination of the averaged values of the coefficients as functions of nonadditive parameters is examined. A.R.H.

N80-10003 Allerton Press, Inc., New York, N. Y.
PARAMETRIC METHOD OF AIRCRAFT ENGINE STATUS DIAGNOSTICS BASED ON LIMITED INFORMATION c07
A. M. Akhmedzyanov, A. P. Tunakov, Kh. S. Gumerov, Yu. D. Degtyarev, and E. I. Morkovnikova *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 6-11 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 12-18 (For primary document see N80-10001 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Ave., N.Y. 10011; $45.00

An algorithm was developed for engine flow path diagnostics based on limited information on the thermogasdynamic parameters. A mathematical model of the engine is used as the diagnostic communication channel. A.R.H.

N80-10004 Allerton Press, Inc., New York, N. Y.
STUDY OF SELF-OSCILLATORY LIQUID FILM FLOW REGIME IN COAXIAL AIR STREAM c34
V. G. Bazarov and L. A. Lyulka *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 12-15 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 19-24 (For primary document see N80-10001 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Ave., N.Y. 10011; $45.00

The unsteady flow of liquid film in the coaxial air stream in coaxial gas-liquid injectors with centrifugal positioning of the centrifugal liquid stage was studied theoretically and experimentally. It is shown that, for the ratio of the liquid dynamic heads from 0.1 to 1.0, with recessing of the nozzle exit (delta = 0.5 to 1.2 times the diameter of the latter), self-oscillatory flow associated with the interaction of the gas and liquid streams develops in the injectors. Recommendations are made for obtaining intense self-oscillations in order to intensify mixture formation for stabilizing the flow process, and to prevent undesirable influence on the combustion process in high heat release rate combustion chambers. Author

N80-10005 Allerton Press, Inc., New York, N. Y.
DYNAMIC CHARACTERISTICS OF LIQUID FILM IN HYBRID HYDROSTATIC BEARING c34
A. I. Belousov and Yu. A. Ravikovich *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 16-19 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 25-29 (For primary document see N80-10001 01-01)
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Relations for the forces arising in the liquid film of hybrid hydrostatic bearings are obtained in explicit form as functions of journal eccentricity and velocity in the bearing. This representation of the forces makes it possible to solve the dynamic problems of rotors on hydrostatic bearings in the nonlinear formulation by analytic methods. The numerical solutions of the problems are simplified. It is also possible to represent results in the form of dynamic coefficients. Comparison of the latter with the experimental data show satisfactory agreement. Author

N80-10006 Allerton Press, Inc., New York, N. Y.
INFLUENCE OF GAS TURBINE ENGINE COMBUSTION CHAMBERS GEOMETRIC PARAMETERS ON MIXTURE FORMATION CHARACTERISTICS c07
P. P. Grigorenko, Yu. A. Spiridonov, and A. V. Talantov *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 20-24 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats Tekh. (USSR), v. 21, no. 3, 1978 p 30-37 (For primary document see N80-10001 01-01)
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Results are presented of a study of the number of rows, number n of holes, and area ratio f of a mixer on the mixing quality theta. It is shown that increase of n and f leads to

increase of the required flowrate G3 at the singular point, characterized by the jet penetration depth h = approximately 0.3d(k). A design diagram is proposed for selecting the optimal mixer parameters corresponding to minimal temperature field nonuniformity. Author

N80-10007 Allerton Press, Inc., New York, N. Y.
ON THE STUDY OF HEAT TRANSFER WITH THE AID OF A LOCAL HEAT FLUX SENSOR c34
Yu. F. Gortyshov, I. M. Varfolomeev, and R. A. Yaushev *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 25-27 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 38-41 (For primary document see N80-10001 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Ave., N.Y. 10011; $45.00

A sensor for measuring the convective heat flux distribution on a limited area based on the thin disc method is discussed. The experimental setup connection between the heat flux and the signal of the corresponding sensor sensitive element is described. The sensor is used for experimental measurement of the local heat transfer during supersonic flow of air in a channel of rectangular section. K.L.

N80-10008 Allerton Press, Inc., New York, N. Y.
ON THE QUESTION OF SELECTING THE CHARACTERISTIC QUANTITY GOVERNING FUEL SELF-IGNITION IN A STREAM c28
V. N. Gruzdev, N. A. Malishevskaya, and M. D. Tauger *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 28-30 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 42-45 (For primary document see N80-10001 01-01)
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The self ignition of liquid fuel injected into a hot gas stream is discussed. Plotting the logarithm of the ignition delay time versus temperature allows the activation energy of kerosene to be determined with account for active center concentration variation, under the condition of constant distance from the injection point to the ignition point. However, with change of the distance from the injection point to the ignition point, the delay time varies nearly in proportion to this distance and consequently does not correlate the influence of all the system parameters. It is proposed that the critical flow speed be taken as the governing quantity. K.L.

N80-10009 Allerton Press, Inc., New York, N. Y.
EXPERIMENTAL STUDY OF THE GASDYNAMIC CHARACTERISTICS OF A STATOR CASCADE WITH COOLING AIR DISCHARGE THROUGH THE VANE SURFACE c34
O. N. Emin, I. I. Kutysh, and P. I. Shvartsman *In its* Soviet Aeron., Vol. 21, No. 3, 1978 p 31-36 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 46-53 (For primary document see N80-10001 01-01)
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The gas dynamic characteristics of perforated turbine stator vanes with air discharge through the vane surface were studied for wide ranges of variation of primary flow velocity and injection intensity. The experimental data were analyzed and compared with various vane film cooling techniques. Film cooling allows the turbine engine inlet gas temperature to be increased significantly with acceptable values of the relative coolant flow rate. However, discharge of the coolant through the vane surface in order to organize film cooling is characterized by increased profile losses. K.L.

N80-10010 Allerton Press, Inc., New York, N. Y.
ON THE INFLUENCE OF LIQUID OSCILLATIONS IN FUEL LINE ON THE HEAD OF A PUMP OPERATING IN REGIMES WITH REVERSE FLOW c34
V. G. Kinelev *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 37-39 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 54-57 (For primary document see N80-10001 01-01)
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Liquid oscillations are studied in a fuel line with separated flow at the entrance to the pump and in the pump flow passages. The influence of the oscillations on the shape of the pump head characteristic are analyzed. K.L.

N80-10011 Allerton Press, Inc., New York, N. Y.
DETERMINATION OF TURNING ANGLE OF A JET IMPINGING ON A BUCKET WITH VISOR c07
L. M. Kotlyar, S. G. Margulis, and E. D. Nesterov *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 40-43 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 58-62 (For primary document see N80-10001 01-01)
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The problem of jet impingment on a bucket with a visor is solved by the singular point method. The dependence of the jet turning angle on several geometric parameters of the bucket is determined. Calculations made on an M-222 computer are compared to experimental results and recommendations are given on estimation of the flow exit angle. K.L.

N80-10012 Allerton Press, Inc., New York, N. Y.
MOST RATIONAL LINEARIZATION OF NONLINEAR UNSTEADY HEAT CONDUCTION PROBLEMS c34
N. L. Menshikh *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 44-47 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 63-67 (For primary document see N80-10001 01-01)
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The correspondence between nonlinear and linearized heat conduction problems is proved from the viewpoint of singularity theory. The most rational technique for linearizing nonlinear unsteady heat conduction problems is developed using the dependence of the thermophysical characteristics on temperature and radiant heat exchange, and approximate solutions of nonlinear conduction problems are obtained. K.L.

N80-10013 Allerton Press, Inc., New York, N. Y.
ON THE FLAME STABILIZATION MECHANISM IN TWO-PHASE FUEL-AIR MIXTURE FLOW c25
B. G. Mingazov, V. A. Shchukin, A. V. Talantov, and I. N. Dyatlov *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 48-52 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats Tekh. (USSR), v. 21, no. 3, 1978 68-74 (For primary document see N80-10001 01-01)
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Flame stabilization was examined with the aid of recirculation zones formed downstream of fuel-air jets and downstream of bluff bodies in the case of high speed gas-air flow around them. The approximate flame stabilization mechanism was identified for combustion of a mixture which is nonhomogeneous with respect to phase. On the basis of the Williams thermal theory, a criterial relation was obtained for determining the two phase mixture stable combustion limits. The obtained experimental data were correlated. R.E.S.

N80-10014 Allerton Press, Inc., New York, N. Y.
ON THE INFLUENCE OF RELATIVE PITCH IN THE SUBSONIC TURBINE CASCADE c07
V. G. Nesterenko and G. L. Podvidz *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 53-56 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 75-80 (For primary document see N80-10001 01-01)
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Flow past a profile in a subsonic turbine cascade with large flow turning angle with relative pitch variation was examined. Calculation of ideal compressible fluid flow in the cascade interblade channel was compared with the results of an experimental study. Two types of separated flow arising with increase of the cascade relative pitch above its limit value were identified. It was found that depending on the curvature of the back of the profile, the separated flow may reattach to the

profile in the exit plane region or for the same relative pitch may not reattach to the profile. R.E.S.

N80-10015 Allerton Press, Inc., New York, N. Y.
STATISTICAL OPTIMIZATION OF STRUCTURAL THERMAL PROTECTION MATERIAL THICKNESS c24
D. D. Nikozakov *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 57-60 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 81-84 (For primary document see N80-10001 01-01)
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The optimal thickness of thermal protection materials used for thermal isolation of structural surfaces subject to the action of random high temperature fields was determined on the basis of experimental data from system tests with sampled, statistical information on the magnitudes of the material erosion. A thermal protection thickness statistical optimization problem was formulated. The necessary computational relations for determining the optimal thickness with high reliability indices and normal erosion magnitude distribution law was obtained and the influence of the erosion magnitude correlation coefficient on the calculation results was studied. The effectiveness of practical use of statistical optimization is illustrated by an example. R.E.S.

N80-10016 Allerton Press, Inc., New York, N. Y.
ANALYTIC DESIGN OF COMPLEX SYSTEMS, II c31
T. K. Sirazetdinov and A. I. Bogomolov *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 61-65 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 85-91 (For primary document see N80-10001 01-01)
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A mathematical formulation of the system analytic design problem is presented and its place in the overall design process is discussed. An approach to analytic design from the viewpoint of the basic control problem is proposed. A survey is presented of studies in which this approach was used to solve specific engineering design problems. R.E.S.

N80-10017 Allerton Press, Inc., New York, N. Y.
ANALYSIS OF FLAME STABILIZATION CONDITIONS USING THE HOMOGENEOUS REACTOR MODEL c25
A. V. Talantov *In its* Soviet Aeron., Vol. 21, No. 3 1979 p 66-71 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 92-99 (For primary document see N80-10001 01-01)
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Flame stabilization relations were derived using the homogeneous reactor model and the conditions of termination of the process in the reactor and the corresponding conditions of flame blowoff from the stabilizer were examined. Characteristics of the obtained blowoff criterion account for the degree of turbulence. The role of turbulence in determining the optimal degree of section blockage was evaluated and the influence of pressure analyzed. R.E.S.

N80-10018 Allerton Press, Inc., New York, N. Y.
EXPERIMENTAL STUDY OF THE TURBULENT WAKE DOWNSTREAM OF A FAN JET c02
O. A. Khachaturyan *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 72-77 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats Tekh. (USSR), v. 21, no. 3, 1978 p 100-107 (For primary document see N80-10001 01-01)
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The flow in the wake of a fan jet is shown to be analogous to the wake of a bluff body of revolution. Relations are proposed which make it possible to calculate from the initial fan jet and stream parameters the temperature and velocity at any section of the wake. R.E.S.

N80-10019 Allerton Press, Inc., New York, N. Y.
EXPERIMENTAL STUDY OF TURBULENCE ENERGY BALANCE COMPONENTS IN THE SECTION OF A RETARDED TURBULENT BOUNDARY LAYER c34
E. V. Shishov, P. S. Roganov, V. M. Belov, and V. N. Afanasev *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 78-81 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 108-112 (For primary document see N80-10001 01-01)
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The results of an experimental study of the turbulence energy balance components in a strongly decelerated equilibrium turbulent boundary layer are presented. The experiments were conducted in an open subsonic windtunnel where the basic parameters of the studied turbulent boundary layer were also presented. All the measurements were made with the aid of a DISA hot-wire anemometer system. The studies were made at the section X = 1410 mm from the virtual origin, where the turbulent boundary layer remained practically equilibrium. The nature of turbulence energy production and dissipation distribution in the boundary layer section confirms the previously mentioned assumption of the existence of two independent regions of intense turbulence energy production. Just as in the case of flow over a flat plate, one region is located at the edge of the viscous sublayer while the other is located in the outer part of the decelerated turbulent boundary layer. M.M.M.

N80-10020 Allerton Press, Inc., New York, N. Y.
THE TURBULENT BOUNDARY LAYER ON A CURVILINEAR SURFACE c34
A. V. Shchukin *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 82-87 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 113-120 (For primary document see N80-10001 01-01)
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An integral method is proposed for calculating the turbulent boundary layer on curvilinear surfaces of constant radius in the absence of a longitudinal pressure gradient. The method is based on polynomial representation of the tangential stress profile and use of the Bradshaw formula to account for the influence of curvature on the mixing length. In order to verify the method the velocity profiles and Stanton numbers were calculated and compared with the experimental values. M.M.M.

N80-10021 Allerton Press, Inc., New York, N. Y.
CORRELATION OF EXPERIMENTAL DATA ON TWO-PHASE-FLOW HEAT TRANSFER IN CONVERGENT PART OF A NOZZLE c34
V. K. Shchukin, A. I. Mironov, V. A. Filin, and N. N. Kovalnogov *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 88-92 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 121-126 (For primary document see N80-10001 01-01)
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Results are presented of correlation c^2 experimental data on gas-particle-flow heat transfer in the convergent part of a nozzle and an approximate technique is examined for a computational estimate of the heat transfer intensification due to the aerodynamic and thermal influences of the condensed particles on the gaseous phase in the zone near the wall. Author

N80-10022 Allerton Press, Inc., New York, N. Y.
STUDY OF HEAT-PIPE HEAT EXCHANGER IN THE SMALL GAS TURBINE ENGINE SYSTEM c07
V. K. Shchukin, I. I. Mosin, N. V. Lokai, and Yu. V. Matveev *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 93-96 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 127-132 (For primary document see N80-10001 01-01)
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A theoretical optimization of the elements of heat-pipe heat exchangers in application to small gas turbine engines (SGTE), is presented in order to study the possibility of using this type of heat exchanger as a SGTE regenerator. The regeneration ratio sigma sub p approximately 0.82 with admissible pressure losses in the heat exchanger passages delta P = 6% was obtained. In order to confirm the validity of the theoretical results, an experimental study was made of a heat exchanger matrix

consisting of 49 ribbed sodium heat pipes on a specially developed test stand simulating SGTE regenerator operating conditions. This study confirms the possibility of using the heat-pipe heat exchanger as an SGTE regenerator. M.M.M.

N80-10023 Allerton Press, Inc., New York, N. Y.
MATHEMATICAL MODELS OF THE PROCESS OF VIBRO-ABRASIVE GRINDING OF PARTS WITH AUTONOMOUS VIBRATIONS IN THE VIBROMACHINE CONTAINER c37
F. S. Yunusov, V. G. Gazizov, N. P. Zinovev, A. A. Nazipov, and V. V. Yakunin *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 97-103 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 133-141 (For primary document see N80-10001 01-01)
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The interactions of autonomous vibrations of a granular medium and a part in a U-shaped vibromachine container is presented. The method of breaking down the motions into transport and relative are used in constructing the mathematical models. The transport motion in the engine system and the relative and absolute motions of the abrasive granules in the container are examined as the interaction of the two mass centers. The model of the vibrations of a part in a granular medium is obtained from the condition of maximal energy of collision of the part with the abrasive granules. Experimental data are presented confirming the conclusions obtained on the basis of analysis of the mathematical models. M.M.M.

N80-10024 Allerton Press, Inc., New York, N. Y.
ANALYTIC REPRESENTATION OF TURBINE CHARACTERISTICS IN FORM CONVENIENT FOR COMPUTER CALCULATION OF GTE PARAMETERS c07
V. I. Bakulev, K. A. Malinovskii, and V. S. Yakushev *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 104-110 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 142-144 (For primary document see N80-10001 01-01)
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A method is proposed for representing turbine characteristics in a form convenient for computer calculation of gas turbine engine parameters. The method makes it possible to specify the turbine characteristic completely by two functions. The form of the functions is approximated well by polynomials, which makes it possible to specify simply the turbine operating field region and is convenient for computer calculation of GTE characteristics. Author

N80-10025 Allerton Press, Inc., New York, N. Y.
STUDY OF RADIAL DIFFUSORS WITH FLOW SWIRL c02
V. T. Volov and V. G. Shakhov *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 111-112 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 148-150 (For primary document see N80-10001 01-01)
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The solution in quadratures for determining the profile of an isogradient vaneless diffusor is obtained for a compressible inviscid fluid. A method for selecting the isogradient diffusor which is equivalent to the vaneless diffusor is discussed. The pressure recovery factor of the isogradient diffusor is determined. The relationship of the dimensions of plane diffusors and of the equivalent isogradient diffusors is presented and a comparison of the combined operation of a profiled diffusor with a self evacuating tube in the quality of operation is reported. A.W.H.

N80-10026 *Allerton Press, Inc., New York, N. Y.*
EXPERIMENTAL STUDY OF CURVILINEAR SURFACE FILM COOLING EFFECTIVENESS c34
V. I. Lokai, A. V. Sikchukin, and R. M. Khairutdinov In its Soviet Aeron., Vol. 21, No. 3 1978 p 113-115 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 150-153 (For primary document see N80-10001 01-01)
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The influence of surface longitudinal curvature on film cooling effectiveness is studied. Corrections for the influence of surface longitudinal curvature on the effectiveness of film cooling on the convex or concave part of turbine blade profiles is introduced. Temperature profiles on the surfaces due to flow mixing and particle separation are determined. The influence of the centrifugal mass force associated with variation of the momentum in curvilinear flows is discussed. A.W.H.

N80-10027 Allerton Press, Inc., New York, N. Y.
LONG-LIFT GTE OPERATION BASED ON TECHNICAL CONDITION c07
A. A. Mukhin, A. A. Kovalev, and A. A. Kornoukhov *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 116-118 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 153-156 (For primary document see N80-10001 01-01)
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Methods for evaluating turbine rotor blade technical condition during operation of the loads on aircraft engines are examined. Methods include using a service life counter, manual recordings and a computer, and a magnetic flight data recorder to record the accumulated time of operation at takeoff and other operating regimes such as number of takeoffs and landings, the number of transient regimes, and the maximum gas temperature in the turbine inlet under flight conditions. A.W.H.

N80-10028 Allerton Press, Inc., New York, N. Y.
USE OF THE METHOD OF VARIABLE DIRECTIONS FOR NUMERICAL STUDY OF THE TEMPERATURE STATES OF A TURBINE DISK WITH BLADES c07
A. M. Polyakov, V. S. Petrovskii, and V. I. Krichakin *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 119-122 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 156-160 (For primary document see N80-10001 01-01)
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The system of two dimensional unsteady heat conduction equations for a turbine blade and disk is presented. The disk profile, specified by arbitrary functions bounding the side surface contour, is analyzed. The transformation of the curvilinear disk region contour into a rectangular region using linear transformation is described. A.W.H.

N80-10029 Allerton Press, Inc., New York, N. Y.
CHARACTERISTICS OF AFTERBURNING BYPASS TURBOJET ENGINE WITH OXYGEN INJECTION INTO THE AFTERBURNER CHAMBER c07
B. D. Fishbein *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 123-126 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 160-164 (For primary document see N80-10001 01-01)
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The thermodynamic effectiveness of increasing the augmentation ratio and thrust of the afterburning bypass turbojet engine with oxygen injection into the afterburner chamber under flight conditions is investigated. The thermodynamic characteristics of the air, mixture of air and oxygen, and products of complete combustion of kerosene in air and in a mixture of air and oxygen are presented. The kerosene flow rate in the turbine and afterburner combustion chambers is determined and the kerosene expansion in the propulsive nozzle is calculated using the temperature dependence of the working fluid specific heat. A.W.H.

N80-10030 Allerton Press, Inc., New York, N. Y.
EXPERIMENTAL DETERMINATION OF HEAT TRANSFER COEFFICIENT WHEN EMPTYING GAS VESSELS c34
L. G. Chirva, A. V. Polshin, and V. S. Kostenko *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 127-129 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 165-167 (For primary document see N80-10001 01-01)
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A determination of the heat transfer coefficient for gas vessels being emptied is presented. Transient processes in satellite

pneumatic systems are discussed. The validity of using the Mikheev formula to calculate emptying processes, with a refinement to the heat transfer coefficient, is reported. A.W.H.

N80-10031 Allerton Press, Inc., New York, N. Y.
SOVIET AERONAUTICS, VOLUME 21, NO. 4
A. V. Talantov, ed. 1978 151 p Transl. into ENGLISH of Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 1-151
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Reports concerning flight control and stability, aerodynamic modeling, structural and stress analysis are presented. For individual titles, see N80-10032 through N80-10060.

N80-10032 Allerton Press, Inc., New York, N. Y.
THE INVERSE PROBLEM OF CONTROL SYSTEM GUARANTEED SENSITIVITY c08
Yu. V. Aleksandrov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 1-5 refs Transl. into ENGLISH of Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4 1978 p 5-10 (For primary document see N80-10031 01-01)
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The problem is examined of determining the automatic control system parameter scatter regions which guarantee deterioration of the system quality by no more than a specified magnitude. Parameter scatter is defined as the region of their deviations relative to the known nominal values for the system being designed. This is an inverse sensitivity theory problem. For linear stationary systems nonlocal methods for solving this problem are described which are intended for high-order systems and computers. F.O.S.

N80-10033 Allerton Press, Inc., New York, N. Y.
MATHEMATICAL MODEL AND STABILITY OF HYDRAULIC SERVO DRIVE WITH JET-THROTTLE REGULATION c34
A. I. Bazhenov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 6-9 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4 1978 p 11-15 (For primary document see N80-10031 01-01)
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The characteristics of hydrodynamic force action on a jet tube are examined for various drive operating regimes, and its dynamic block diagram which accounts for the secondary feedbacks from hydrodynamic force action on the jet tube, is presented. For solution of the problem of the stability and self-oscillations of the system, the results of theoretical and experimental studies are used. The logarithmic frequency characteristics method is applied to the contruction of the phase stability boundary. F.O.S.

N80-10034 Allerton Press, Inc., New York, N. Y.
ON STABILITY OF OPERATION OF LIQUID ROCKET ENGINE WITH TUBOPUMP ASSEMBLY (TPA) c20
F. D. Bairamov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 10-15 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4 1978 p 16-22 (For primary document see N80-10031 01-01)
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The Lyapunov second method is used to study the technical stability of the nominal operating regime of a bipropellant LRE with TPA. Two typical LRE schemes: with gas generator fed by separate propellant; and with gas generator operating on the primary propellant components. The sufficient stability (arbitrary finite) time intervals and for the second scheme only for an infinite (arbitrary finite) time interval. F.O.S.

N80-10035# Allerton Press, Inc., New York, N. Y.
ANALYTIC DESIGN OF REGULATORS FOR CONTROLLING ELASTIC FLIGHT VEHICLE ROTATION ABOUT THE LONGITUDINAL AXIS c08
A. A. Baloev *In its* Soviet Aeron., v. 21, no. 4, 1978 p 16-21 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4 1978 p 23-28 (For primary document see N80-10031 01-01)
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On the basis of classical variational calculus an algorithm is developed for synthesis of the optimal control of elastic flight vehicle rotation about the longitudinal axis. The known analogous algorithms developed on the basis of the dynamic programming method are more tedious, since their application requires solution of nonlinear Riccatti-type equations. F.O.S.

N80-10036 Allerton Press, Inc., New York, N. Y.
ON THE LAMINAR BOUNDARY ON THE SURFACE OF A CYLINDER MOVING IN A FLUID c34
V. A. Bashkin and G. M. Dzhamgarov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 22-26 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4 1978 p 29-35 (For primary document see N80-10031 01-01)
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In the framework of laminar boundary layer theory, the flow pattern and heat transfer of a circular cylinder advancing with constant velocity into a resting fluid are described. The nature of the solution behavior near the outer and inner edges of the boundary layer was studied. On the basis of these results the correctness of using functional and asymptotic series for solution of the subject problem is examined. F.O.S.

N80-10037 Allerton Press, Inc., New York, N. Y.
OPTIMAL CONTROL OF FLIGHT VEHICLE WITH ELASTIC ELEMENTS c08
V. V. Vatolin, G. L. Degtyarev, and N. K. Yunusov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 27-31 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 36-42 (For primary document see N80-10031 01-01)
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The problem is examined of synthesizing an optimal control as is a function of the measured variables. The optimality criterion is the value of a quadratic form of the observed variables at the current instant of time. An analytic expression is obtained for the optimal control and the condition which the flight vehicle state measurement technique must satisfy and analyze the influence of measurement sensor location on controlled motion quality. F.O.S.

N80-10038 Allerton Press, Inc., New York, N. Y.
ANALOG MODELING IN STUDYING SUPERSONIC FLOW AROUND A WING AND ITS GOVERNING ANALOG-CRITERIA c02
R. I. Vinogradov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 32-37 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4 1978 p 43-48 (For primary document see N80-10031 01-01)
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In examining the gas-hydraulic analogy, no systematic study has been made of the questions for determining the criteria which ensure proper analog modeling. The mathematical similitude analog-criterion concept is introduced. Recommendations are given on the conduct of mixed analog-physical modeling when conducting experiments to study the flow patterns around an oscillating wing by the gas-hydraulic analogy method. F.O.S.

N80-10039 Allerton Press, Inc., New York, N. Y.
INFLUENCE OF INITIAL DEFLECTIONS ON BUCKLING OF CYLINDRICAL SHELLS UNDER CREEP CONDITIONS WITH COMBINED ACTION OF AXIAL COMPRESSION AND INTERNAL PRESSURE c39
Yu. P. Vorotilin and L. M. Kurshin *In its* Soviet Aeron., v. 21, no. 4, 1978 p 38-42 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 49-54 (For primary document see N80-10031 01-01)
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Initial deflection of general forms which account for the symmetrics and asymmetric components is introduced into cylindrical shell analysis. The problem of determining the critical deformation is solved with the aid of the Sanders-McComb-

Schlechte theorem for geometric and physical nonlinearity. The stress distribution through the shell thickness is taken to be linear. Comparison of the results is made with an analysis based on the linearized equations. F.O.S.

N80-10040# Allerton Press, Inc., New York, N. Y.
FIELD STATE ESTIMATION BY LEAST SQUARES c85
G. L. Degtyarev *In its* Soviet Aeron., v. 21, no. 4, 1978 p 43-47 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats Tekh., (USSR), v. 21, no. 4, 1978 p 43-47 (For primary document see N80-10031 01-01)
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A recurrence relation is obtained for estimating the state of a statistical field using a measured variable containing measurement errors with known statistical characteristics. The equation is found for determining the aposteriori estimate and an approximate method for solving the obtained equations is given. F.O.S.

N80-10041# Allerton Press, Inc., New York, N. Y.
SELF-SIMILAR SOLUTIONS IN THE DESTRUCTION AND MELTING PROBLEM WITH ACCOUNT FOR ABRUPT DENSITY CHANGE c24
G. V. Druzhinin and V. G. Pavlov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 48-52 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 61-67 (For primary document see N80-10031 01-01)
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Self-similar solutions are applied to unsteady heat transfer problems for composite thermoprotective coatings. A solid body under the influence of temperature is examined for the case when part of the material undergoes physical or chemical transformation into a gas or liquid while the remainder transforms into a porous medium. It is shown that self-similar solutions accelerate the numerical calculation, correlate the experimental results, and serve as a standard for comparison of approximate calculation results. J.M.S.

N80-10042 Allerton Press, Inc., New York, N. Y.
BASIC PROBLEM OF AIRCRAFT GAS TURBINE ENGINE ANALYTIC DESIGN, PART 1 c07
Yu. V. Kozhevnikov, V. O. Borovik, V. S. Ivanov, V. A. Talyzin, Aglullin, and Ya. V. Malusov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 53-57 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 68-74 (For primary document see N80-10031 01-01)
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The general problem of gas turbine engine design is considered. The problem of modeling and optimizing the engine thermodynamic and gasdynamic parameters is defined as the basic problem; the solution yields the system of basic data for constructive detail design of the gas turbine engine elements. A formulation of the basic analytic design problem is presented accounting for the effect of random factors and the multiregime nature of engine operation. J.M.S.

N80-10043 Allerton Press, Inc., New York, N. Y.
ANALYSIS OF THIN-WALL BEAMS BY THE METHOD OF SEGMENTS c39
A. S. Kratov and V. G. Shataev *In its* Soviet Aeron., v. 21, no. 4, 1978 p 58-61 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 75-80 (For primary document see N80-10031 01-01)
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The stress-strain state of thin wall structures such as a flight vehicle wing or body having an irregular structural scheme is examined. It is assumed that the cross-section contour does not change in the deformation process, the skin works in shear, and the stringers work in tension-compression. The structure is broken down into several segments of variable section, which are analyzed numerically by a finite sum method. An algorithm is proposed for constructing the segment coupling matrix equations. The solution is realized in the form of an ALGOL program and the analysis results are compared with experimental data. J.M.S.

N80-10044 Allerton Press, Inc., New York, N. Y.
SELECTING THE GEOMETRIC PARAMETERS AND POSITION OF A NOSE FLAP ON THE ROOT PROFILE OF A SWEPT WING USING TUNNEL TEST DATA, PART 2 c05
A. I. Matyah, V. A. Sterlin, V. A. Popov, V. V. Isaev, and G. A. Cheremukhin *In its* Soviet Aeron., vol. 21, no. 4, 1978 p 62-66 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 81-87 (For primary document see N80-10031 01-01)
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The installation of a nose flap on the swept wing of a transport airplane is analyzed. The aerodynamic effects associated with installation of the flap are identified and evaluated on the basis of data from wind tunnel tests of a full-scale airplane model. It is shown that the use on the nose of the swept wing of combined mechanization in the form of a slat on the outer part of the wing and a nose flap at the root improves the aerodynamic characteristics in the region of both moderate and high angles of attack. Some questions of design nature which may arise when installing a nose flap are included. J.M.S.

N80-10045 Allerton Press, Inc., New York, N. Y.
LAMINAR BOUNDARY LAYER CALCULATION FROM EXPERIMENTAL PRESSURE DISTRIBUTION c02
V. D. Osorgin, A. N. Popkov, O. P. Sidorov, and S. O. Sidorova *In its Soviet Aeron., v. 21, no. 4, 1978 p 67-71 refs Transl.* into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 88-93 (For primary document *see N80-10031 01-01*)
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A technique for calculating the laminar boundary layer from an experimental pressure distribution is presented. For this the discrete experimental wing profile surface pressure function is approximated by a spline function which is continuous together with its first derivative. A single-parameter method is used to calculate the boundary layer at a profile specified in tabular form and the calculation results are presented. J.M.S.

N80-10046 Allerton Press, Inc., New York, N. Y.
ON MODELING SENSITIVITY OF A LINEAR SYSTEM TO REDUCTION OF ITS ORDER BY THE INFINITESIMAL TRANSFORMATION METHOD IN THE YAW MOTION CONTROL PROBLEM c08
V. G. Pavlov *In its* Soviet Aeron., v. 21, no. 4 1978 p 72-75 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats Tekh., (USSR), v. 21, no. 4, 1978 p 94-98 (For primary document see N80-10031 01-01)
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A method based on the use of some concepts of continuous group theory is proposed for solving the problem of linear system sensitivity to reduction of its order. The basic idea is that the original process is embedded in a continuous ensemble obtained by transformation of the nominal process. A system of lower order is taken as the original system. The entire process ensemble corresponding to higher-order systems is obtained by transformation of the original system. Use of this method is examined in the yaw motion control problem. It is shown that the sensitivity study can be modeled by a continuous transformation group defined by the Lie algebra of three basis operators. A precise estimate of system sensitivity to reduction of its order is obtained. J.M.S.

N80-10047 Allerton Press, Inc., New York, N. Y.
ON THE EMPENNAGE SNAP-THROUGH PROBLEM c08
V. A. Pavlov and S. K. Chernikov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 76-80 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved Aviats Tekh., (USSR), v. 21, no. 4, 1978 p 99-104 (For primary document see N80-10031 01-01)
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The structural stability of flight vehicle empennage-type structures is examined. A mathematical model made up of a

system on nonlinear integral-differential equations is obtained and solved by the successive loading method with refinement of the roots using the Newton-Kantorovich method. Results of calculations are presented and are confirmed by experiments.
J.M.S.

N80-10048 Allerton Press, Inc., New York, N. Y.
ELECTRICAL CHARGING OF FABRIC AND FILM MATERIALS c33
B. G. Popov, V. N. Baklygin, and I. I. Chistyakov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 81-86 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 105-111 (For primary document see N80-10031 01-01)
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The mechanism of fabric and film material electrification during contact with one another is examined. Results of an analytic and experimental study are presented which establish the *connection between the charge formed on the surface and the* properties of the materials and the intensity of their mutual contact.
J.M.S.

N80-10049 Allerton Press, Inc., New York, N. Y.
PROPULSIVE NOZZLE ELECTRIFICATION c33
G. P. Potapov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 87-91 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4 p 112-116 (For primary document see N80-10031 01-01)
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The electrostatic potential of an operating propulsive nozzle, represented by an electrical current generator is determined. *Qualitative and quantitative data are obtained on the rocket engine* electrical capacitance charging mechanism accounting for the thermodynamic and thermophysical properties of the ionized gaseous stream and the properties of the equilibrium wall-plasma system.
J.M.S.

N80-10050 Allerton Press, Inc., New York, N. Y.
MOTION OF RECTANGULAR WING BETWEEN PARALLEL WALLS c02
K. V. Rozhdestvenskii *In its* Soviet Aeron., v. 21, no. 4, 1978 p 92-97 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 117-123 (For primary document see N80-10031 01-01)
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The method of matched decompositions is used to find the asymptotic expression for the potential of the flow around a *rectangular wing between parallel walls. Formulas for the lift* coefficient are obtained and numerical results are presented illustrating the influence of the walls on the lift force for various *wing aspect ratios and distances between the walls.* The results are valid for small relative distance of the wing from the lower wall.
Author

N80-10051 Allerton Press, Inc., New York, N. Y.
ON MINIMIZING INTEGRAL QUADRATIC ESTIMATES c64
L. G. Romanenko *In its* Soviet Aeron., v. 21, no. 4, 1978 p 98-102 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 124-129 (For primary document see N80-10031 01-01)
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To ensure optimal transient process behavior in a regulation *system the selection of the closed loop system transfer function* denominator polynomial coefficients are related with integral quadratic estimates minimization. Minimization of complex *estimates and estimates for the regulated quantities with zeros* of the transfer functions are discussed. The problem of selecting the gains of an autopilot for stabilizing flight vehicle altitude is *presented as an example.*
A.W.H.

N80-10052 Allerton Press, Inc., New York, N. Y.
CREEP ANALYSIS OF THIN-WALL STRUCTURES SUBJECT TO TRANSIENT HEATING AND LOADING c39
V. G. Shataev, Yu. A. Kashfraziev, and A. G. Samartsev *In its* Soviet Aeron., v. 21, no. 4 1978 p 103-105 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 130-132 (For primary document see N80-10031 01-01)
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The strength and stiffness design of the thin wall structures of a flight vehicle wing or body type under unsteady creep conditions with time varying loads and temperatures is examined. *A solution algorithm for analyzing the thin wall structures is* proposed. The unsteadiness of loading and aerodynamic heating are discussed in relation to their influence on the stress-strain *state of the structure.*
A.W.H.

N80-10053 Allerton Press, Inc., New York, N. Y.
STRUCTURAL ANALYSIS OF VARIABLE-SWEEP WINGS c05
N. A. Shelomov and N. A. Gorozhankin *In its* Soviet Aeron., v. 21, no. 4, 1978 p 106-113 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 133-141 (For primary document see N80-10031 01-01)
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A technique based on a combined system model in the differential formulation is presented for structural analysis of *variable sweep wings. The problem is examined for momentless* conical and cylindrical skewed shells located between the wing ribs. The differential equations of equilibrium of a skewed *momentless shell element are discussed.*
A.W.H.

N80-10054 Allerton Press, Inc., New York, N. Y.
DETERMINATION OF STRAIN FIELDS NEAR CONCENTRATORS FROM STRAIN GAGE INDICATORS c39
A. L. Brushkovskii *In its Soviet Aeron., v. 21, no. 4, 1978* p 142-144 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aeron. Tekh., (USSR), v. 21, no. 4, 1978 p 114-116 *(For primary document see N80-10031 01-01)*
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A technique is presented for determining the strain fields in stress concentrator zones from strain gage indications without account for, and with partial or complete account for, the design *schemes of the objects. The strain determination algorithms* (without account for the design schemes of the elements) are discussed due to their poor sensitivity to changes of the field *outside the comparison nodes. Methods to account for the* physical aspect of the error in the algorithm are described.
A.W.H.

N80-10055 Allerton Press, Inc., New York, N. Y.
STRESS-STRAIN DIAGRAM APPROXIMATION c39
I. U. Vyshedkevich *In its* Soviet Aeron., v. 21, no. 4, 1978 p 117-119 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 144-147 (For primary document see N80-10031 01-01)
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Stress-strain diagram approximation for spherical and infinitely long cylindrical shells is described. The influence of the magnitude *of the tension diagram approximating function upon the accuracy* of the solution in a large strain region is examined.
A.W.H.

N80-10056 Allerton Press, Inc., New York, N. Y.
SPECTRAL ANALYSIS OF SURFACE IRREGULARITIES AND VIBRATIONS OF 'SPID' SYSTEM ELEMENTS DURING BURNISHING OPERATIONS c31
A. A. Naryshkin and D. A. Zhuravlev *In its* Soviet Aeron., v. 21, no. 4, 1978 p 120-123 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 147-150 (For primary document see N80-10031 01-01)
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Spectral analysis of surfaces burnished with a diamond tool, *taking into account the vibration of the SPID system elements* is discussed. The normed energy spectral densities are determined.
A.W.H.

N80-10057 Allerton Press, Inc., New York, N. Y.
ON THIN-WALL BEAM EFFECTIVE STIFFNESS **c39**
V. A. Pavlov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 124-128 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 151-155 (For primary document see N80-10031 01-01)
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The bending stiffness of a thin wall beam in a constrained, deplanation zone is analyzed. A condition of the analysis, that the law of planar distribution of the relative elongation is violated, is described. The bending stiffness of a thin wall beam determined from the Odinakov theory is presented. A.W.H.

N80-10058 Allerton Press, Inc., New York, N. Y.
APPLICATION OF THE FACTOR INTERPOLATION METHOD IN FLIGHT VEHICLE LANDING GEAR ANALYTIC DESIGN **c06**
A. V. Sviin *In its* Soviet Aeron., v. 21, no. 4, 1978 p 129-131 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 155-158 (For primary document see N80-10031 01-01)
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A technique for solving the problem of landing gear analytic design with random inputs is presented. The probabilities that the landing gear quality indices will lie in given regions with respect to the values of their mathematical expectations and dispersions are discussed. The mathematical expectations and dispersions of the landing gear quality indices are determined using the factor interpolation method. A.W.H.

N80-10059 Allerton Press, Inc., New York, N. Y.
PARACHUTE-ROCKET DECELERATION SYSTEM DESIGN **c02**
V. N. Semenov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 132-134 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviat. Tekh., (USSR), v. 21, no. 4, 1978 p 158-162 (For primary document see N80-10031 01-01)
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The design of a parachute rocket deceleration system is examined. The design stage which admits the formal approach is identified. An algorithm for solving the problem in this stage is proposed and calculation results are presented. A.W.H.

N80-10060 Allerton Press, Inc., New York, N. Y.
FLOW-AROUND SMALL-ASPECT-RATIO DELTA WING WITH VORTEX "BURSTING" **c02**
G. A. Cheremukhin, E. A. Truneva, and E. Ya. Pivkin *In its* Soviet Aeron., v. 21, no. 4, 1978 p 135-140 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 162-167 (For primary document see N80-10031 01-01)
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The vortex flow around a delta wing of small aspect ratio is discussed. The connection between the state of the vortex and the flow over the surface of the wing is examined. Influences on the pressure distribution and the aerodynamic characteristics, due to the appearance of the vortex bursting above the wing surface are reported. A.W.H.

N80-10061 Allerton Press, Inc., New York, N. Y.
SOVIET AERONAUTICS, VOLUME 22, NO. 1
A. V. Talamov, ed., A. I. Bogomolov, ed., B. S. Vinogradov, ed., and A. F. Gurov, ed. 1979 119 p refs Transl. into ENGLISH of Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 126 p
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The aerodynamics of gas turbine engines is considered. Topics covered include heat transfer in turbulent flows, stationary temperature fields in air cooled turbine rotor blades, diesel fuel combustion in turbulent flow, and mass exchange between primary zone and secondary air jets in gas turbine engine combustion chambers. For individual titles, see N80-10062 through N80-10091.

N80-10062 Allerton Press, Inc., New York, N. Y.
CALCULATION OF WORKING PROCESS IN SLOW-COMPRESSION PISTON-TYPE AERODYNAMIC TUBE **c02**
A. B. Berezovskii and V. B. Panfilovich *In its* Soviet Aeron., v. 22, no. 1 1979 p 1-5 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 3-10 (For primary document see N80-10061 01-01)
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The gasdynamic and thermal processes during high enthalpy gas flow in the passages of aeroengine elements and gas flow at high Mach numbers around bodies are studied in the "slow-compression" aerodynamic tube. The desired parameters in the tube are achieved by compressing the working gas by a free piston. The working gas compression process is examined numerically under the following assumptions: (1) the process is quasi-stationary; (2) the gas is ideal; (3) the piston is massless; (4) the heat exchange between the gas and the ambient medium is neglected; and (5) there is no piston friction on the compression tube walls. J.M.S.

N80-10063 Allerton Press, Inc., New York, N. Y.
GAS CURTAINS IN GAS TURBINE ENGINES **c07**
I. S. Varganov *In its* Soviet Aeron., v. 22, no. 1 1979 p 6-10 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 11-16 (For primary document see N80-10061 01-01)
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The application of gas curtains for thrust reversal in gas turbine engines is numerically examined. The use of gas curtains in the fan flow makes it possible to vary the flow rate ratio as a function of flight regime. The energy capabilities of this reversal technique are determined in terms of the relative required flow rate. J.M.S.

N80-10064 Allerton Press, Inc., New York, N. Y.
HEAT TRANSFER IN TURBULENT GAS FLOWS WITH HIGH-FREQUENCY PRESSURE OSCILLATIONS **c34**
B. M. Galitseiskii *In its* Soviet Aeron., v. 22, no. 1 1979 p 11-15 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 17-23 (For primary document see N80-10061 01-01)
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The results of experimental studies conducted to determine the conditions under which the maximal intensity of the heat exchange process is realized with resonant oscillations of turbulent gas flow in channels are reported. It is shown that intense resonant acoustic oscillations of turbulent gas streams in channels can significantly influence the heat transfer process. J.M.S.

N80-10065 Allerton Press, Inc., New York, N. Y.
STUDY OF HOMOGENEOUS COMBUSTION CHAMBER *TEMPERATURE FIELD NONUNIFORMITY WITH PRIMARY ZONE PARAMETER VARIATION* **c07**
O. A. Evin, V. M. Yankovskii, and I. N. Pyatlov *In its* Soviet Aeron., v. 22, no. 1 1979 p 16-19 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 24-29 (For primary document see N80-10061 01-01)
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The influence of the primary zone parameters on the temperature field nonuniformity of homogeneous combustion chambers was studied using a flame tube of a production combustion chamber. Results are discussed. J.M.S.

N80-10066 Allerton Press, Inc., New York, N. Y.
MEASUREMENT OF LIQUID PUMP TORQUE IN THE STARTING REGIME **c37**
N. S. Ershov, V. V. Ramodina, and V. V. Chervakov *In its* Soviet Aeron., v. 22, no. 1 1979 p 20-25 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 12, no. 1, 1979 p 30-35 (For primary document see N80-10061 01-01)
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A technique for experimental determination of the torque required by the pump in the transient and unsteady regimes was developed in order to verify the theoretical calculations and evaluate the magnitude of the dynamic component of the torque. R.E.S.

N80-10067 Allerton Press, Inc., New York, N. Y.
COMPUTER CALCULATION OF STATIONARY TEMPERATURE FIELDS IN AIR-COOLED TURBINE ROTOR BLADES c07

V. I. Lokai, Yu. N. Ivanshin, and Sh. Sh. Abdrakhmanov *In its* Soviet Aeron., v. 22, no. 1 1979 p 26-29 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 36-40 (For primary document see N80-10061 01-01)
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A simple engineering method is presented for computer calculation of the stationary temperature fields in turbine blades with longitudinal cooling passages with variable boundary conditions on the gas and coolant sides, with account for variation of the blade cross section area and the temperature dependence of the material thermal conductivity. The method is based on breaking the blade down into segments and applying to each segment the solution of the one dimensional heat conduction problem (along the radius) with matching of the solutions at the junctures. R.E.S.

N80-10068 Allerton Press, Inc., New York, N. Y.
SELECTION OF OPTIMAL PARAMETERS OF HEAT-PIPE HEAT EXCHANGER FOR A GAS TURBINE ENGINE c07

N. V. Lokai and I. I. Mosin *In its* Soviet Aeron., v. 22, no. 1 1979 p 30-34 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 41-46 (For primary document see N80-10061 01-01)
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Requirements that assist in achieving the maximal heat exchanger degree of regeneration are examined. It is shown that in a specific gas turbine engine equipped with a heat exchanger the degree of regeneration can be improved by observing the following conditions: (1) The heat transfer capacity of the heat exchanger heat pipes must exceed the rate of heat transfer from the gas and air sides; (2) the condition of equality of certain dimensionless groupings on the hot and cold sides of the heat exchanger must be satisfied. R.E.S.

N80-10069 Allerton Press, Inc., New York, N. Y.
COMPUTER CALCULATION OF STATIONARY TEMPERATURE FIELDS IN COOLED TURBINE DISCS c07

V. I. Lokai, V. V. Zhulkov, and R. D. Fakhrutdinov *In its* Soviet Aeron., v. 22, no. 1 1979 p 35-38 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 47-50 (For primary document see N80-10061 01-01)
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A method is presented which can be used to calculate the temperature distribution along the radius of a turbine disk which is cooled on both sides. R.E.S.

N80-10070 Allerton Press, Inc., New York, N. Y.
METHOD FOR CALCULATING OPTIMAL PARAMETERS OF HIGH-PRESSURE PNEUMATIC DRIVES c37

M. Ya. Panov, A. M. Kurganov, and V. P. Kozelkov *In its* Soviet Aeron., v. 22, no. 1 1979 p 39-43 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 51-56 (For primary document see N80-10061 01-01)
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A method for calculating pneumatic drive optimization for turbines is presented. R.E.S.

N80-10071 Allerton Press, Inc., New York, N. Y.
SYSTEMATIZATION OF SIMPLE DETAIL PARTS OF REGULABLE NOZZLE OF GAS TURBINE ENGINE c07

I. E. Sapozhkov and E. D. Stenkin *In its* Soviet Aeron., v. 22, no. 1 1979 p 44-49 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 57-63 (For primary document see N80-10061 01-01)
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A subsystem principle of studying gas turbine design which accounts for the characteristics of the working process and which can be used in studying various mechanical systems is proposed. The structural schemes and 'typizations' of gas turbine engine regulable nozzle details were determined. These schemes are necessary in developing optimal design methods and their computer formalization. M.M.M.

N80-10072 Allerton Press, Inc., New York, N. Y.
LIQUID EJECTOR WITH PERFORATED NOZZLE c34

A. A. Stolyarov *In its* Soviet Aeron., v. 22, no. 1 1979 p 50-53 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Techn. (USSR), v. 22, no. 1, 1979 p 64-68 (For primary document see N80-10061 01-01)
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The characteristics of the single stage gas ejector with perforated nozzle with perforation permeability coefficient 0.1 to 0.2 (ratio of whole area to lateral surface area) of the perforated nozzle segment are close to the characteristics of the multistage supersonic ejectors. It was concluded that it is advisable to use perforated nozzle liquid ejectors primarily with large ejecting and ejected pressure differentials. M.M.M.

N80-10073 Allerton Press, Inc., New York, N. Y.
GENERALIZED HEAT AND MASS TRANSFER LAW FOR INTERNAL FLOWS c34

A. A. Khalatov *In its* Soviet Aeron., v. 22, no. 1 1979 p 54-57 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 69-72 (For primary document see N80-10061 01-01)
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The integral swirl parameter, which is the ratio of the flow of rotational momentum to the axial momentum in a channel linear dimension was used to characterize the mass and heat transfer coefficients. Analysis of the mathematical formulation shows that the governing parameters for the case are the local maximal axial velocity and the instantaneous swirl intensity. M.M.M.

N80-10074 Allerton Press, Inc., New York, N. Y.
DYNAMICS OF DIESEL FUEL COMBUSTION IN TURBULENT FLOW c28

F. A. Khamidullin, A. F. Kuzin, O. V. Strogonov, Yu. V. Troitskii, and A. V. Talantov *In its* Soviet Aeron., v. 22, no. 1 1979 p 58-63 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 73-80 (For primary document see N80-10061 01-01)
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A study of diesel fuel and also TS-1 kerosene and B-70 gasoline combustion in a turbulent stream is presented. These fuels are compared and the dependence of the combustion zone length and the combustion time on mixture composition, velocity, and initial temperature under the model combustion chamber conditions was established. M.M.M.

N80-10075 Allerton Press, Inc., New York, N. Y.
STUDY OF MASS EXCHANGE BETWEEN PRIMARY ZONE AND SECONDARY AIR JETS IN GAS TURBINE ENGINE COMBUSTION CHAMBERS c07

V. G. Shumachenko, V. M. Yankovskii, and A. V. Stalantov *In its* Soviet Aeron., v. 22, no. 1 1979 p 64-67 ref Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 81-85 (For primary document see N80-10061 01-01)
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The experimental and theoretical determination of the secondary air jets G sub pz in application to combustion chambers is presented as well as the flow structure in the primary zone which is formed by the secondary air jets of the first row of

holes. In such combustion chambers, the air flow rate through the front end assembly G sub pz does not exceed 5-10% of the overall air flow rate through the chamber, and most of the air enters the primary zone from the secondary air jets. M.M.M.

N80-10076 Allerton Press, Inc., New York, N. Y.
APPROXIMATE CALCULATION OF THE LAMINAR BOUNDARY LAYER IN MICRONOZZLES c34
F. A. Akhmedyanova, A. A. Vaindiner, P. G. Danilaev, and N. F. Salikhov *In its* Soviet Aeron., v. 22, no. 1 1979 p 68-70 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 86-88 (For primary document see N80-10061 01-01)
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The laminar boundary layer arising during perfect gas flow in a two dimensional Laval micronozzle with a thermally insulated wall is approximated by a simple method for a Prandtl number of one. The solution is compared to results obtained by solving the transformed system of laminar boundary layer equations by the finite difference method. The integral characteristics of the approximate solution agree well with the exact solution results, but the approximate method does not yield high accuracy in constructing the velocity profile. The approximate method allows the use of a Nairi type computer for the calculations and is very efficient. Calculation by the finite difference method on the M-222 computer required 30 times more computer time. It is advised that the approximate method be used for engineering calculations. K.L.

N80-10077 Allerton Press, Inc., New York, N. Y.
AERODYNAMIC EFFICIENCY OF GAS TURBINE INTAKE DUCT c02
I. G. Gogolev, P. V. Korolev, Yu. D. Kudashev, V. A. Magala, and B. A. Shifrin *In its* Soviet Aeron., v. 22, no. 1 1979 p 71-73 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 88-91 (For primary document see N80-10061 01-01)
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Cold flow tests were conducted on an aerodynamic stand for a small transport gas turbine power plant segment consisting of a combustion chamber, an intake duct, and a stator cascade. Pneumometric probes were used to measure static pressure, total pressure, and flow angles in the radial and tangential directions at the segment control sections. Velocity fields, mass rate distributions and the streamline shape were found. Energy losses in the segment elements were determined separately and their mutual influence during combined operation was analyzed. Increasing the radius of curvature of the intake duct surface was found to eliminate flow separation and reduce nonuniformity in the radial and circumferential flow parameter distribution. Although the stator cascade efficiency remained unchanged, the efficiency of the entire segment was increased as a result of elimination of energy losses in the flow entering the cascade. K.L.

N80-10078 Allerton Press, Inc., New York, N. Y.
CENTRIPETAL TURBINE FABRICATION TECHNOLOGY c07
L. P. Goldun and A. A. Polyakov *In its* Soviet Aeron., v. 22, no. 1 1979 p 74-75 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats Tekhn. (USSR), v. 22, no. 1, 1979 p 91-93 (For primary document see N80-10061 01-01)
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A simple technology for fabricating model turbine wheels under laboratory conditions is presented. With this technology, the required number of models of blades with different geometric shapes are fabricated from a single master casting of the rotor or stator flow passage model. K.L.

N80-10079 Allerton Press, Inc., New York, N. Y.
DESIGN OF BOUNDARY-LAYER AIR INTAKES c02
V. T. Kalugin, T. V. Klebanova, Yu. I. Kozlov, and V. N. Koshevoi *In its* Soviet Aeron., v. 22, no. 1 1979 p 76-79 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 93-96 (For primary document see N80-10061 01-01)
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A technique for calculating the flow parameters of an air intake in which the entrance height is commensurate with the boundary layer thickness is presented. In the absence of air inflow a highly developed separated stagnant zone forms ahead of the air intake inlet. Comparison of theoretical and experimental results shows that the proposed technique is suitable for calculating the flow parameters at various degrees of throttling. K.L.

N80-10080 Allerton Press, Inc., New York, N. Y.
APPLICATION OF GRADIENT METHOD TO STUDY OF HEAT TRANSFER IN AXISYMMETRIC CHANNELS OF DIFFERENT CONFIGURATION c34
N. N. Kovalnogov *In its* Soviet Aeron., v. 22, no. 1 1979 p 80-83 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 96-100 (For primary document see N80-10061 01-01)
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Standardized relations are obtained for calculating heat transfer coefficients by the gradient method in axisymmetric channels of constant wall thickness and different configurations. Methods of minimizing the required computer time without reducing the accuracy of the heat transfer coefficient determinations are examined. K.L.

N80-10081 Allerton Press, Inc., New York, N. Y.
UNLOADING THE DRIVE OF GAS DISTRIBUTER VALVES OPERATING AT HIGH PRESSURES c37
I. A. Krivosheev, A. M. Rusak, I. M. Urakev, and Z. G. Shaikhutdinov *In its* Soviet Aeron., v. 22, no. 1 1979 p 84-86 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats Tekhn. (USSR), v. 22, no. 1, 1979 p 100-102 (For primary document see N80-10061 01-01)
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The load reduction on the drive of gas distributer valves which operate at high inlet pressures in the supercritical regime is discussed. The use of the discharging gas reaction for unloading the valve, when critical gas flow is maintained in the narrowest flow section of the valve is described, utilizing gas dynamic relations. Various valve schemes are compared and their static force characteristics are derived. A.W.H.

N80-10082 Allerton Press, Inc., New York, N. Y.
APPLICATION FACTOR OF TWO-DIMENSIONAL TRANSVERSE SONIC JET INTERACTING WITH SUPERSONIC STREAM c02
V. I. Krishtal *In its* Soviet Aeron., v. 22, no. 1 1979 p 87-89 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 102-105 (For primary document see N80-10061 01-01)
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The amplification factor for injection of a planar sonic jet at a 90 degree angle into a supersonic stream with turbulent boundary layer is determined. The dependence of the amplification factor on the geometric characteristics of the injection system, on the gas dynamic parameters of the jet, and on the primary flow is discussed. The amplification factor as a function of undisturbed flow Mach numbers is presented. A.W.H.

N80-10083 Allerton Press, Inc., New York, N. Y.
ON THE INFLUENCE OF SHORT SHROUD PLATFORMS ON TURBINE STAGE OPERATION c07
R. V. Kuzmichev and G. V. Proskuryakov *In its* Soviet Aeron., v. 22, no. 1 1979 p 90-92 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 105-107 (For primary document see N80-10061 01-01)
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Techniques for improving the efficiency of unshrouded turbine stages using short shroud platforms are examined. Two air turbine engine models were tested for the overall improvement in stage efficiency. The use of short one sided and two sided shroud

platforms on the performance of the rotor blades, the blade tips, and the flow structure near the periphery is discussed. Stage efficiency improvement in the limits of the inter row clearance and radial clearance is determined. A.W.H.

N80-10084 Allerton Press, Inc., New York, N. Y.
SEMI-EMPIRICAL METHOD FOR DETERMINING LOCAL HEAT TRANSFER COEFFICIENTS FOR FLOW AROUND A SPHERE **c34**
L. I. Kudryashev and N. I. Klyuev *In its* Soviet Aeron., v. 22, no. 1 1979 p 93-95 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 107-109 (For primary document see N80-10061 01-01)
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The cooling of a heated solid sphere in a subsonic gas stream is examined. The local heat transfer coefficients, determined on the basis of the temperature distribution in the vicinity of the surface points of the sphere, are calculated. The heat transfer coefficients are presented as functions of polar angle and time. A.W.H.

N80-10085 Allerton Press, Inc., New York, N. Y.
STUDY OF COMBINED OPERATION OF SELF-EVACUATING VORTEX TUBE WITH DIFFUSER **c02**
A. P. Merkulov and V. T. Volov *In its* Soviet Aeron., v. 22, no. 1 1979 p 96-98 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 109-112 (For primary document see N80-10061 01-01)
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The effect created by the self evacuating vortex tube (SEVT) and the cooling of the near axis SEVT layers in certain operating regimes is examined. An isogradient radially symmetric diffuser which transforms the kinetic energy of the gas entering the diffuser into pressure energy is described. The reduction of SEVT dimensions for use in aircraft equipment is discussed. A.W.H.

N80-10086 Allerton Press, Inc., New York, N. Y.
ON AXIAL TURBINE STAGE ROTOR BLADE TWIST WITH TANGENTIAL TILT OF THE STATOR VANES **c07**
Yu. I. Mityushkin, A. V. Perevoznikov, and V. P. Yakovlev *In its* Soviet Aeron., v. 22, no. 1 1979 p 99-101 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 112-115 (For primary document see N80-10061 01-01)
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The tangential tilt of the stator vanes (TTSV) in the axial turbine stage, serves as an effective means for reducing the reactivity gradient along the rotor blade, significantly redistributes the flow parameters along the flow path height, and imposes definite limitations on rotor blade twist. Tests were made of nine turbine stages with nozzle exit velocities M(c1) = 0.48 to 0.5 and Reynolds numbers Re(c1) = (5 to 5.7) X 10 to the 5th power to study the influence of rotor blade trailing edge twist on the efficiency of turbine stages with TTSV. A.R.H.

N80-10087 Allerton Press, Inc., New York, N. Y.
WARMUP OF LRE CHAMBERS WITH REGENERATIVE COOLING **c20**
V. V. Orlov *In its* Soviet Aeron., v. 22, no. 1 1979 p 102-104 ref Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 115-117 (For primary document see N80-10061 01-01)
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A technique developed for calculating the unsteady temperature regimes of chambers with regenerative cooling, based on the one-dimensional model of the heat propagation process in the chamber structural elements is reviewed and used with a M-220M computer to study the warmup of chambers of different construction during engine startup. Analysis of the results obtained made it possible to detect certain chamber thermal loading characteristics in the startup regime which influence the stress-strain state of the chamber structural elements. Information on the chamber temperature status during startup is necessary for evaluating chamber functioning in the launch regime of liquid propellant rockets. A.R.H.

N80-10088 Allerton Press, Inc., New York, N. Y.
STUDY OF SIZE DISTRIBUTION OF OIL DROPS FORMED IN GTE OIL **c37**
P. G. Petrov and O. A. Povarov *In its* Soviet Aeron., v. 22, no. 1 1979 p 105-107 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 117-119 (For primary document see N80-10061 01-01)
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The replica method was used to study the oil drop size distribution. A probe was installed in the air-oil separator housing ahead of the impeller. After reaching steady-state conditions and complete stabilization of the parameters, the sample was taken (measurement time 0.06 to 0.1 sec). Then the drop 'replicas' were photographed through a microscope. Photography of a calibrated wire with identical magnification was used to determine the dimensions of the oil drop replicas. Results show that the air-oil mixture which forms in the oil system lines has a very broad oil drop size spectrum with the maximum number of drops (about 20%) being on the order to 10 microns in diameter. A.R.H.

N80-10089 Allerton Press, Inc., New York, N. Y.
NONSTATIONARITY OF HEAT TRANSFER IN AXIAL TURBINE BLADING DURING ENGINE STARTUP **c07**
A. M. Polyakov, V. S. Petrovskii, and V. I. Krichakin *In its* Soviet Aeron., v. 22, no. 1 1979 p 108-111 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 119-123 (For primary document see N80-10061 01-01)
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In all gas turbine element temperature calculations, the coefficient of heat transfer are assumed to be independent of the nonstationarity of the heat transfer process. Of interest are the time dependence of the local coefficient of heat transfer on axial gas turbine rotor blade surfaces found from the results of temperature survey during startup. The first-stage and second-stage rotor blade temperatures at the mean diameter of the turbine of an aircraft auxiliary power unit engine were continuously recorded. The temperature values through the blade thickness were averaged. A.R.H.

N80-10090 Allerton Press, Inc., New York, N. Y.
LASER DOPPLER VELOCIMETER (LDV) STUDY OF SECONDARY FLOWS IN TURBINE CASCADE **c07**
A. M. Topunov, B. Tikhomirov, and L. L. Chernyshev *In its* Soviet Aeron., v. 22, no. 1 1979 p 112-114 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 123-126 (For primary document see N80-10061 01-01)
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The development of secondary flows in the blade-row passages and the effectiveness of the techniques for controlling the flow are determined by a large number of factors, specifically by the vorticity and turbulence characteristics of the flow at the entrance and the magnitude of the Reynolds number. The secondary flows have an unsteady nature because of periodic separation of the decelerated flow medium in the region of the corner formed by the back of the blade and the end wall. The influences of these factors on the secondary flow characteristics were studied using a stand consisting of a straight profile cascade with closed air flow system and a Laser Doppler Velocimeter (LDV). The LDV instrumentation system, utilizing the differential scheme is described and the energy loss coefficients obtained are analyzed. A.R.H.

N80-10091 Allerton Press, Inc., New York, N. Y.
PNEUMATIC DISTRIBUTOR FOR TURBOJET ENGINE CONTROL SYSTEM **c07**
M. G. Khabibullin *In its* Soviet Aeron., v. 22, no. 1 1979 p 115-116 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 126-127 (For primary document see N80-10061 01-01)

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A distributor, introduced into the thrust reverser control system of the NK-8-2U TJE for the Tu-154 airplane, consists of the housing with sleeve, in the bore of which the spool is installed. The central port in the housing is for air entry from the pressure source - the cavity downstream of the TJE compressor. There are two ports for air supply to the actuator, and two others for discharge of the used air into the atmosphere. The support lands are made from graphite-impregnated metal to ensure small dry-friction forces during displacement, since the graphite-impregnated metal acts as a lubricant for the contacting surfaces and eliminates the possibility of spool binding. The middle distributing land is metal, is integral with the spool and its width is considerably less than the width of the supporting lands, which makes it possible to reduce the spool working travel and the overall dimensions of the unit. In order to eliminate the possibility of contact of the land with the sleeve, since the metal-metal friction pair would not operate satisfactorily under dry-friction conditions, the diameter of the land is less than the diameter of the supporting lands by 0.01 to 0.02 mm with allowance for thermal expansion. A.R.H.

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N80-10092 California Univ., Los Angeles.
TWO-DIMENSIONAL FLOW PAST CONVEX AND CONCAVE CORNERS AT TRANSONIC SPEED AND TWO-DIMENSIONAL FLOW AROUND A PARABOLIC NOSE AT SUBSONIC AND TRANSONIC SPEEDS Ph.D. Thesis
Kazuhiro Kusunose 1979 150 p
Avail: Univ. Microfilms Order No. 7921431

Two dimensional flows past a Prandtl-Meyer expansion corner and an infinite wedge at transonic speeds which have exact solutions, and the nose solution for a two dimensional finite leading edge radius airfoil which has a singularity at the nose under the small disturbance approximations are discussed. Lift and drag acting on the parabolic nose in the subsonic flow which can include the incompressible flow case as a special case are obtained. For the transonic case the nose equation with a body surface boundary condition and appropriate far field boundary conditions which can match to the outer transonic small disturbance solutionance solution is solved numerically to get a pressure distribution in the nose region. Using the outer transonic solution and the nose solution a uniformly valid pressure distribution on the entire body surface of a finite leading radious airfoil for the transonic flow is obtained. Dissert. Abstr.

N80-10093 Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
PREDICTION OF AERODYNAMIC FORCES ON A CIRCULAR CYLINDER AND THIN AIRFOIL IN A TRANSONIC AIR-STREAM BY THE FINITE ELEMENT METHOD Ph.D. Thesis
James Edward Marsh 1979 184 p
Avail: Univ. Microfilms Order No. 7920914

The finite element method was used to solve the nonlinear, small disturbance, transonic, velocity potential equation for problems of steady flow over a circular cylinder and over a thin airfoil in a uniform steady airstream. Three subproblems were investigated for the circular cylinder. First, three different types of trial functions were investigated to approximate the solution for the velocity potential function for the case of incompressible flow without circulation. The second subproblem for the cylinder was to use the two conforming elements to obtain solutions for incompressible flow with circulation. The third subproblem for the cylinder was to solve the compressible flow problem without circulation using the new element. Convergence of iterative finite element solution schemes for transonic (mixed elliptic hyperbolic) flows was investigated for the airfoil problem. Dissert. Abstr.

N80-10094 Cincinnati Univ., Ohio.
CALCULATION OF OPTIMAL COORDINATES FOR TWO-DIMENSIONAL INCOMPRESSIBLE FLOW Ph.D. Thesis
Rabindra Kumar Rout 1979 198 p
Avail: Univ. Microfilms Order No. 7922618

Two dimension steady symmetric incompressible laminar flow past a class of blunt and sharp nosed bodies is investigated in optimal coordinates. The analysis is carried out for different problem parameters and the solution is specialized for the cases of the parabola, a semi-infinite thin flat plate and the flow against a vertical wall. The problem is formulated by mapping the body from a Cartesian plane into a conformal plane by applying a Schwarz-Christoffel transformation. This type of transformation maps the flow field into a stagnation point flow in the conformal plane. The governing differential equations are developed in an optimal coordinate system. A boundary layer and parabolized Navier-Stokes analysis is used for the solution procedure in the optimal coordinate system. Dissert. Abstr.

N80-10095 California Inst. of Tech., Pasadena.
SOME MEASUREMENTS IN SYNTHETIC TURBULENT BOUNDARY LAYERS Ph.D. Thesis
Oemer Savas 1979 138 p
Avail: Univ. Microfilms Order No. 7972055

Synthetic turbulent boundary layers, constructed on a flat plate by generating systematic moving patterns of turbulent spots in a laminar flow, are investigated. Spots which were generated periodically in space and time near the leading edge to form a regular hexagonal pattern are examined. The measured variable was local intermittency; i.e., the probability of observing turbulent flow at a particular point in space and time. The evolution of various synthetic flows along the plate are reported and illustrated using X-T diagrams. Dissert. Abstr.

N80-10096 Ohio State Univ., Columbus.
AN EXPERIMENTAL INVESTIGATION OF FORCED MIXING OF A TURBULENT BOUNDARY LAYER IN AN ANNULAR DIFFUSER Ph.D. Thesis
Robert Joseph Shaw 1979 179 p
Avail: Univ. Microfilms Order No. 7922556

The physical details of the forced mixing process of a turbulent boundary layer in an axisymmetric annular diffuser is investigated. Conventional wing like vortex generators were used as the forced mixing device. Flow field measurements made at four axial locations downstream of the vortex generators are presented. Total pressure profiles measured to determine boundary layer profiles and vortex positions are discussed along with yaw angularity measurements made at two axial locations. Three vortex generator configurations were tested. The difference between configurations involved changes in size and relative vortex generator positions. All three vortex generator configurations tested provided increases in diffuser performance. Dissert. Abstr.

N80-10097 Engineering Sciences Data Unit, London (England).
WING-BODY YAWING MOMENT AND SIDEFORCE DERIVATIVES DUE TO SIDESLIP: Nv AND Yv
1979 14 p
(ESDU-79006; ISBN-0-85679-251-9; ISSN-0141-397X) For information on availability of series, sub-series and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC $386.50

A means is provided for estimating the yawing moment and sideforce derivatives due to sideslip for wing-body combinations at small angles of attack and sideslip at subsonic speeds. For stability calculations, an accurate prediction is more important for Nv than for Yv. The data are primarily intended for predicting Nv. Because Nv is dependent on the choice of yaw axis position, a knowledge of Yv is needed to convert Nv from one axis position to another. An accurate estimate of Yv is difficult and the method given may involve substantial errors for certain configurations, but it is considered adequate in allowing for changes in yaw axis position between 0.41(b) and 0.61(b) as, subject to that limitation, quite large uncertainties in Yv do not give rise to significant errors in Nv. ESDU

N80-10098 Texas Univ. at Arlington.
CROSS FLOW FAN EXPERIMENT DEVELOPMENT AND FINITE ELEMENT MODELING Ph.D. Thesis
Gary James Harloff 1979 230 p
Avail: Univ. Microfilms Order No. 7922981

A compressible one dimensional finite element differential analysis is presented which accounts for area changes, rotor lumped blade forces, turbulent wall friction, and heat input. The analysis permits integration through the rotors. Good agreement with test data is obtained. The analysis indicates that appreciable heating of the through flow occurs. The heat input is due to viscous dissipation in the airfoils. This heat input causes thermal chocking in the second stage rotor fan. An incompressible two dimensional finite element analysis is also presented which also permits integration through the rotors. The flow outside the rotors is treated as potential flow and the flow inside the rotors is treated as rotational flow. Good agreement with low speed test data is obtained. Maximum velocities of twice the rotor tip speed are predicated inside the outlet rotor. Dissert. Abstr.

N80-10099 Cincinnati Univ., Ohio.
INTEGRAL SOLUTIONS OF THE HIGH REYNOLDS NUMBER SMALL SEPARATION PROBLEM Ph.D. Thesis
Surinder Khullar 1979 131 p
Avail: Univ. Microfilms Order No. 7922604

Two Different integral techniques are developed to solve the high Reynolds number small separation problem. The small separation problem, according to the Triple Deck theory, is defined here as one where the separated region is restricted to the lower deck. Numerical solutions to the steady state form of the integral equations are obtained using a fourth order accurate Runge Kutta method for the supersonic free interaction cases and supersonic flow over properly scaled flat plate/ramp combinations. Several different velocity profiles are tried to improve the integral solutions. Results obtained by these approximate methods compare well with more exact numerical solutions when an appropriate velocity profile is used. Solutions to the unsteady form of the developed integral equations are obtained by an implicit finite difference method for the case of supersonic flow over expansion ramps. Dissert. Abstr.

N80-10100 Houston Univ., Tex.
FLOW AROUND AXISYMMETRIC BODIES: THE DIRECT AND INVERSE PROBLEMS Ph.D. Thesis
Mohamed Fouad Zedan 1979 258 p
Avail: Univ. Microfilms Order No. 7922438

A new method was developed to solve the inverse problem for incompressible axisymmetric potential flow about a body of revolution. The method was developed initially for elements of constant intensity utilizing two equivalent conditions: the tangency condition in the form dr/dx = v/u, and the condition of zero stream function over the body surface. Higher order axial singularity distributions were also developed for the solution of the direct problem. Substantial improvements in the accuracy and numerical efficiency over the von Karman method (base method for direct problem) were attained without significant sacrifice of simplicity or increase in the computation time and storage requirements. The method has comparable accuracy to the sophisticated and numerically involved surface singularity Douglas-Neumann method, for most body shapes. Dissert. Abstr.

N80-10101*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF WINGLETS ON A FIRST-GENERATION JET TRANSPORT WING. 6: STABILITY CHARACTERISTICS FOR A FULL-SPAN MODEL AT SUBSONIC SPEEDS
Stuart G. Flechner Oct. 1979 69 p refs
(NASA-TP-1330; L-12514) Avail: NTIS HC A04/MF A01 CSCL 01A

A wind tunnel investigation to identify changes in stability and control characteristics of a model KC-135A due to the addition of winglets is presented. Static longitudinal and lateral-directional aerodynamic characteristics were determined for the model with and without winglets. Variations in the aerodynamic characteristics at various Mach numbers, angles of attack, and angles of slidslip are discussed. The effect of the winglets on the drag and lift coefficients are evaluated and the low speed and high speed characteristics of the model are reported. A.W.H.

N80-10102*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
WIND-TUNNEL INVESTIGATION OF THE VALIDITY OF A SONIC-BOOM-MINIMIZATION CONCEPT
Robert J. Mack and Christine M. Darden Oct. 1979 47 p refs
(NASA-TP-1421; L-12661) Avail: NTIS HC A03/MF A01 CSCL 01A

The Langley unitary plan unitary plan wind tunnel was used to determine the validity of a sonic-boom-minimization theory. Five models - two reference and three low-boom constrained - were tested at design Mach numbers of 1.5 and 2.7. Results show that the pressure signatures generated by the low-boom models had significantly lower overpressure levels than those produced by the reference models and that small changes in the Mach number and/or the lift caused relatively small changes in the signature shape and overpressure level. Boundary-layer effects were found in the signature shape and overpressure level. Boundary-layer effects were found to be sizable on the low-boom models, and when viscous corrections were included in the analysis, improved agreement between the predicted and the measured signatures was noted. Since this agreement was better at Mach 1.5 than at Mach 2.7, it was concluded that the minimization method was definitely valid at Mach 1.5 and was probably valid at Mach 2.7, with further work needed to resolve the uncertainty. A.R.H.

N80-10103*# Johns Hopkins Univ., Laurel, Md.
ADVANCED MISSILE TECHNOLOGY. A REVIEW OF TECHNOLOGY IMPROVEMENT AREAS FOR CRUISE MISSILES Final Report
L. L. Cronvich and H. P. Liepman Washington Oct. 1979 66 p refs
(NASA Order L-75242A)
(NASA-CR-3187; BFD-0-79-001) Avail: NTIS HC A04/MF A01 CSCL 01A

Technology assessments in the areas of aerodynamics, propulsion, and structures and materials for cruise missile systems are discussed. The cruise missiles considered cover the full speed, altitude, and target range. The penetrativity, range, and maneuverability of the cruise missiles are examined and evaluated for performance improvements. A.W.H.

N80-10104*# National Aeronautics and Space Administration, Washington, D. C.
THE SIGNIFICANCE OF WING END CONFIGURATION IN AIRFOIL DESIGN FOR CIVIL AVIATION AIRCRAFT
H. Zimmer Oct. 1979 35 p refs Transl. into ENGLISH of "Die Bedeutung der Fluecelendformen Tragfluecelentwurf fuer Flugzeuge der Zivilen Luftfahrt", paper-77-030 Deutsche Gesellschaft fuer Luft-und Raumfahrt, Jahrestagung 10th, Berlin, 15 Sep. 1977 40 p Transl. by Leo Kanner Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75711; Paper-77-030) Avail: NTIS HC A03/MF A01 CSCL 01A

Lift-dependent induced drag in commercial aviation aircraft is discussed, with emphasis on the necessary compromises between wing and configuration modifications which better lift performance and the weight gains accompanying such modifications. Triangular, rectangular and elliptical configurations for wing ends are considered; attention is also given to airfoil designs incorporating winglets. Water tunnel tests of several configurations are reported. In addition, applications of wing and modifications to advanced technology commercial aviation aircraft and the Airbus A-300 are mentioned. Author

N80-10105*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ESTIMATION OF ATTAINABLE LEADING-EDGE THRUST FOR WINGS AT SUBSONIC AND SUPERSONIC SPEEDS
Harry W. Carlson, Robert J. Mack, and Raymond L. Barger 1979 62 p refs
(NASA-TP-1500; L-13032) Avail: NTIS HC A04/MF A01 CSCL 01A

The factors which place limits on the theoretical leading edge thrust are identified. An empirical method for the estimation of attainable thrust is presented. The method is based on

the use of simple sweep theory to permit a two dimensional analysis, the use of theoretical airfoil programs to define thrust dependence on local geometric characteristics, and the examination of experimental two dimensional airfoil data to define limitations imposed by local Mach numbers and Reynolds numbers. Comparisons of theoretical and experimental aerodynamic characteristics for a series of wing body configurations are examined. A.W.H.

N80-10106*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

EFFECT OF SEVERAL AIRFRAME/NOZZLE MODIFICATIONS ON THE DRAG OF A VARIABLE-SWEEP BOMBER CONFIGURATION

Richard J. Re and David E. Reubush Washington 1979 171 p ref

(NASA-TM-80129; L-13043) Avail: NTIS HC A08/MF A01 CSCL 01A

A variable sweep bomber aircraft model was investigated to identify modifications for drag reduction. Modifications included simulated two dimensional nozzles, staggered and extended nozzles; short, long, and no interfairings between the nozzles; partial and complete wing-glove fairings; glove-fuselage sidefairing; fuselage underfairing; and wing pods. The variable wing sweep and variable exhaust nozzles of the scale model are discussed. A.W.H.

N80-10107*# National Aeronautics and Space Administration. *Ames Research Center, Moffett Field, Calif.*

WORKSHOP ON THRUST AUGMENTING EJECTORS

A. E. Lopez, ed., D. G. Koenig, ed., D. S. Green, ed. (Naval Air Development Center, Warminster, Penn.), and K. S. Nagaraja, ed. (Air Force Flight Dynamics Lab) Sep. 1979 509 p Conf. held at Moffett Field, Calif., 28-29 Jun. 1978; Sponsored by NADC and AFFDL

(NASA-CP-2093; A-7887) Avail: NTIS HC A22/MF A01 CSCL 01A

The state of the art of ejector technology is assessed and the desired direction of future studies in all aspects of ejector thrust augmenting systems is delineated. For individual titles, see N80-10108 through N80-10133.

N80-10108*# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.

RECENT DEVELOPMENTS IN EJECTOR TECHNOLOGY IN THE AIR FORCE: AN OVERVIEW

K. S. Nagaraja *In* NASA. Ames Res. Center Workshop on Thrust Augmenting Ejectors Sep. 1979 p 1-22 refs (For primary document see N80-10107 01-02)

Avail: NTIS HC A22/MF A01 CSCL 01A

Basic and applied studies in thrust augmentation conducted at the Aerospace Research Laboratory at Wright-Patterson AFB which led to an effective configuration of the jet flap diffuser ejector, are reviewed. A method for compressible ejector flow analysis, developed in support of the preliminary design of an ejector thrust aircraft, is discussed and applied to single- and two-stage ejectors. A.R.H.

N80-10109*# National Aeronautics and Space Administration. *Ames Research Center, Moffett Field, Calif.*

NASA OVERVIEW

David G. Koenig *In its* Workshop on Thrust Augmenting Ejectors Sep. 1979 p 23-40 refs (For primary document see N80-10107 01-02)

Avail: NTIS HC A22/MF A01 CSCL 01A

The history of NASA efforts at Ames Research Center in researching the performance and application of thrusting augmentors is reviewed. Current objectives include: (1) parametric description of thrust augmentor application to STOL and V/STOL; (2) the use of theoretical and empirical data; (3) aircraft-augmentor integration; and (4) key design considerations for STOL transport and V/STOL fighter aircraft. Test facilities are described and ejector development and performance are assessed. A.R.H.

N80-10110*# Naval Air Development Center, Warminster, Pa.

AN OVERVIEW OF CURRENT NAVY PROGRAMS TO DEVELOP THRUST AUGMENTING EJECTORS

K. A. Green *In* NASA. Ames Res. Center Workshop on Thrust Augmenting Ejectors Sep. 1979 p 41-54 refs (For primary document see N80-10107 01-02)

Avail: NTIS HC A22/MF A01 CSCL 01A

The primary objective of Navy sponsored research in thrust augmentation is the development of an improved augmenter for V/STOL application. In support of this goal, a data base is being established to provide an accurate prediction capability for use in ejector design. A general technology development of ejectors and associated effects presently is split into the more specific areas of lift and control, since thrust augmenting ejectors may be suitable for both. Research areas examined include advanced diffuser and end wall design; advanced primary nozzles; analytic studies; augmenting reaction controls; and nozzle design. A.R.H.

N80-10111*# Boeing Military Airplane Development, Seattle, Wash.

NUMERICAL PREDICTION OF 3-D EJECTOR FLOWS

Donald W. Roberts and Gerald C. Paynter *In* NASA. Ames Res. Center Workshop on Thrust Augmenting Ejectors Sep. 1979 p 55-70 refs (For primary document see N80-10107 01-02)

Avail: NTIS HC A22/MF A01 CSCL 01A

The use of parametric flow analysis, rather than parametric scale testing, to support the design of an ejector system offers a number of potential advantages. The application of available 3-D flow analyses to the design ejectors can be subdivided into several key elements. These are numerics, turbulence modeling, data handling and display, and testing in support of analysis development. Experimental and predicted jet exhaust for the Boeing 727 aircraft are examined. A.R.H.

N80-10112*# Rockwell International Corp., Columbus, Ohio. Columbus Aircraft Div.

VISCID/INVISCID INTERACTION ANALYSIS OF THRUST AUGMENTING EJECTORS

P. M. Bevilacqua and A. D. DaJoode *In* NASA. Ames Res. Center Workshop on Thrust Augmenting Ejectors Sep. 1979 p 71-84 refs Sponsored by ONR (For primary document see N80-10107 01-02)

(Contract N00014-77-C-0271)

Avail: NTIS HC A22/MF A01 CSCL 01A

A method was developed for calculating the static performance of thrust augmenting ejectors by matching a viscous solution for the flow through the ejector to an inviscid solution for the flow outside the ejector. A two dimensional analysis utilizing a turbulence kinetic energy model is used to calculate the rate of entrainment by the jets. Vortex panel methods are then used with the requirement that the ejector shroud must be a streamline of the flow induced by the jets to determine the strength of circulation generated around the shroud. In effect, the ejector shroud is considered to be flying in the velocity field of the jets. The solution is converged by iterating between the rate of entrainment and the strength of the circulation. This approach offers the advantage of including external influences on the flow through the ejector. Comparisons with data are presented for an ejector having a single central nozzle and Coanda jet on the walls. The accuracy of the matched solution is found to be especially sensitive to the jet flap effect of the flow just downstream of the ejector exit. Author

N80-10113*# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio. Flight Control Div.

INTERNAL-EXTERNAL FLOW INTEGRATION FOR A THIN EJECTOR-FLAPPED WING SECTION

Henry W. Woolard *In* NASA. Ames Res. Center Workshop on Thrust Augmenting Ejectors Sep. 1979 p refs (For primary document see N80-10107 01-02)

Avail: NTIS HC A22/MF A01 CSCL 01A

Thin airfoil theories of an ejector flapped wing section are reviewed. The global matching of the external airfoil flow with the ejector internal flow and the overall ejector flapped wing section aerodynamic performance are examined. Mathematical models of the external and internal flows are presented. The delineation of the suction flow coefficient characteristics are discussed. The idealized lift performance of an ejector flapped wing relative to a jet augmented flapped wing are compared. A.W.H.

N80-10114*# Air Force Weapons Lab., Kirtland AFB, N. Mex.
ON THE RATIONAL DESIGN OF COMPRESSIBLE FLOW EJECTORS
P. J. Ortwerth *In* NASA. Ames Res. Center. Workshop on Thrust Augmenting Ejectors Sep. 1979 p 109-139 refs (For primary document see N80-10107 01-02)
Avail: NTIS HC A22/MF A01 CSCL 01A

A fluid mechanics review of chemical laser ejectors is presented. The characteristics of ejectors with single and multiple driver nozzles are discussed. Methods to compute an optimized performance map in which secondary Mach number and performance are computed versus mass ratio, to compute the flow distortion at each optimized condition, and to determine the thrust area for the design point to match diffuser impedence are examined. A.W.H.

N80-10115*# Rockwell International Science Center, Thousand Oaks, Calif.
A COMPUTATIONAL MODEL FOR THREE-DIMENSIONAL INCOMPRESSIBLE WALL JETS WITH LARGE CROSS FLOW
W. D. Murphy, V. Shankar, and N. D. Malmuth *In* NASA. Ames Res. Center Workshop on Thrust Augmenting Ejectors Sep. 1979 p 141-166 refs (For primary document see N80-10107 01-02)
(Contract N62269-77-C-0412)
Avail: NTIS HC A22/MF A01 CSCL 01A

A computational model for the flow field of three dimensional incompressible wall jets prototypic of thrust augmenting ejectors with large cross flow is presented. The formulation employs boundary layer equations in an orthogonal curvilinear coordinate system. Simulation of laminar as well as turbulen wall jets is reported. Quantification of jet spreading, jet growth, nominal separation, and jet shrink effects due to corss flow are discussed. A.W.H.

N80-10116*# Rockwell International Corp., Columbus, Ohio.
COMPUTER AIDED DESIGN STUDY OF HYPERMIXING NOZZLES
L. A. Mefferd and P. M. Bevilacqua *In* NASA. Ames Res. Center Workshop on Thrust Augmenting Ejectors Sep. 1979 p 167-186 refs (For primary document see N80-10107 01-02)
(Contract N00019-77-C-0527)
Avail: NTIS HC A22/MF A01 CSCL 01A

The development of a nozzle which combines the hypermixing and lobe mechanisms to achieve further increases in jet entrainment and ejector performance is investigated. A computer program which incorporates a two equation turbulence model and is used to predict and compare the evolution of jets from various nozzle designs is discussed. Increasing the length of the nozzle lobes and an alternating lobe nozzle are a methods examined for increasing the entrainment rate. A.W.H.

N80-10117*# George Washington Univ., Washington, D. C.
NONSTEADY-FLOW THRUST AUGMENTING EJECTORS
Joseph V. Foa *In* NASA. Ames Res. Center Workshop on Thrust Augmenting Ejectors Sep. 1979 p 187-203 refs (For primary document see N80-10107 01-02)
Avail: NTIS HC A22/MF A01 CSCL 01A

Ejector augmenters in which the transfer of mechanical energy from the primary to the secondary flow takes place through the work of interface pressure forces are investigated. Nonsteady flow processes are analyzed from the standpoint of energy transfer efficiency and a comparison of a rotary jet augmenter to an ejector is presented. A.W.H.

N80-10118*# Wright State Univ., Dayton, Ohio.
LINEARIZED UNSTEADY JET ANALYSIS
Herman Viets and Michael Piatt *In* NASA. Ames Res. Center Workshop on Thrust Augmenting Ejectors Sep. 1979 p 205-223 refs (For primary document see N80-10107 01-02)
(Grant AF-AFOSR-3525-78)
Avail: NTIS HC A22/MF A01 CSCL 01A

The introduction of a time dependency into a jet flow to change the rate at which it mixes with a coflowing stream or ambient condition is investigated. The advantages and disadvantages of the unsteady flow are discussed in terms of steady state mass and momentum transfer. A linear system which is not limited by frequency constraints and evolves through a simplification of the equations of motion is presented for the analysis of the unsteady flow field generated by the time dependent jet. A.W.H.

N80-10119*# Duvvuri Research Associates, Chula Vista, Calif.
INTEGRATION OF EJECTORS INTO HIGH-SPEED AIRCRAFT
Tirumalesa Duvvuri *In* NASA. Ames Res. Center Workshop on Thrust Augmenting Ejectors Sep. 1979 p 225-238 (For primary document see N80-10107 01-02)
Avail: NTIS HC A22/MF A01 CSCL 01A

The integration of ejectors into forebodies is considered for transonic and supersonic flight. Topics discussed include mixing flow in ducts, prediction of flow fields and external aerodynamics. K.L.

N80-10120*# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
SOME TESTS ON SMALL-SCALE RECTANGULAR THROAT EJECTOR
W. N. Dean, Jr. (Air Force Flight Test Center) and M. E. Franke *In* NASA. Ames Res. Center Workshop on Thrust Augmenting Ejectors Sep. 1979 p 239-251 refs (For primary document see N80-10107 01-02)
Avail: NTIS HC A22/MF A01 CSCL 01A

A small scale rectangular throat ejector with plane slot nozzles and a fixed throat area was tested to determine the effects of diffuser sidewall length, diffuser area ratio, and sidewall nozzle position on thrust and mass augmentation. The thrust augmentation ratio varied from approximately 0.9 to 1.1. Although the ejector did not have good thrust augmentation performance, the effects of the parameters studied are believed to indicate probable trends in thrust augmenting ejectors. Author

N80-10121*# Vought Corp., Dallas, Tex.
AUGMENTING EJECTOR ENDWALL EFFECTS
J. L. Porter and R. A. Squyers *In* NASA. Ames Res. Center Workshop on Thrust Augmenting Ejectors Sep. 1979 p 253-271 refs (For primary document see N80-10107 01-02)
Avail: NTIS HC A22/MF A01 CSCL 01A

Rectangular inlet ejectors which had multiple hypermixing nozzles for their primary jets were investigated for the effects of endwall blowing on thrust augmentation performance. The ejector configurations tested had both straight wall and active boundary layer control type diffusers. Endwall flows were energized and controlled by simple blowing jets suitably located in the ejector. Both the endwall and boundary layer control diffuser blowing rates were varied to determine optimum performance. High area ratio diffusers with insufficient endwall blowing showed endwall separation and rapid degradation of thrust performance. Optimized values of diffuser boundary layer control and endwall nozzle blowing rates in an ejector augmenter were shown to achieve high levels of augmentation performance for maximum compactness. K.L.

N80-10122*# Rockwell International Corp., Columbus, Ohio. Columbus Aircraft Div.
AN INVESTIGATION OF CORNER SEPARATION WITHIN A THRUST AUGMENTER HAVING COANDA JETS Final Report
M. R. Seiler *In* NASA. Ames Res. Center Workshop on Thrust Augmenting Ejectors Sep. 1979 p 273-293 refs (For primary document see N80-10107 01-02)
(Contract N62269-76-C-0402)
(NADC-76153-30) Avail: NTIS HC A22/MF A01 CSCL 01A

The development of separation in corners of thrust augmentor wings having Coanda jets was investigated using hot film surface sensors and pressure transducers. Separation on the test augmentor began at a corner very close to the augmentor exit and then rapidly proceeded upstream. Measurements of the pressure fields in the corner region indicated that a modified form of the Stratford criterion could be used to predict the onset of separation. Testing was conducted over a range of nozzle pressure ratios, aspect ratios, diffuser angles, and designs of the boundary layer and Coanda nozzles. K.L.

N80-10123*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
LARGE-SCALE TURBULENT STRUCTURES IN JETS AND IN FLOWS OVER CAVITIES AND THEIR RELATIONSHIP TO ENTRAINMENT AND MIXING
V. Sarohia and P. F. Massier *In* NASA. Ames Res. Center Workshop on Thrust Augmenting Ejectors Sep. 1979 p 295-309 refs (For primary document see N80-10107 01-02)
Avail: NTIS HC A22/MF A01 CSCL 01A

Large scale structures in jets and in flows over cavities were investigated experimentally to determine their role in entrainment, mixing, and noise production. The presence of these structures resulted in growth of the shear layer and entrainment. Merging of adjacent large scale structures caused the near field pressure signal in excited flows. It is believed that both the entrained fluid as well as its eventual mixing with the jet flow can be controlled by introducing pulsation in the jet flow at a frequency for which the flow is most unstable. K.L.

N80-10124*# Naval Postgraduate School, Monterey, Calif.
ENTRAINMENT CHARACTERISTICS OF UNSTEADY SUBSONIC JETS
M. F. Platzer, J. M. Simmons (Queensland Univ., Brisbane, Australia), and K. Bremhorst (Queensland Univ., Brisbane, Australia) *In* NASA. Ames Res. Center Workshop on Thrust Augmenting Ejectors Sep. 1979 p 311-324 refs Submitted for publication (For primary document see N80-10107 01-02)
Avail: NTIS HC A22/MF A01 CSCL 01A

The effectiveness of jet unsteadiness in enhancing flow entrainment was assessed. It was conducted that entrainment depends on the type and amount of jet unsteadiness. Apparently, the mere introduction of jet unsteadiness by small sinusoidal flow angle variations is insufficient to enhance entrainment but, it should be noted that the results were obtained at measuring stations which are all many nozzle widths downstream of the jet nozzle. Thus, no fully conclusive statement can be made at this time about the entrainment close to the nozzle. The high entrainment of the fluidically oscillated jet was caused by the high-frequency content of this square wave type of oscillation but more detailed measurements are clearly needed, in particular for the fluidically oscillated and the pulsed jets. Practical ejector application requires the proper trade-off between entrainment and primary nozzle thrust efficiency. M.M.M.

N80-10125*# Calgary Univ. (Alberta). Dept. of Mechanical Engineering.
A SIMPLE APPARATUS FOR THE EXPERIMENTAL STUDY OF NON-STEADY FLOW THRUST-AUGMENTER EJECTOR CONFIGURATIONS
J. M. Khare and J. A. C. Kentfield *In* NASA. Ames Res. Center Workshop on Thrust Augmenting Ejector Sep. 1979 p 325-349 refs (For primary document see N80-10107 01-02)
Avail: NTIS HC A22/MF A01 CSCL 01A

A flexible, and easily modified, test rig is described which allows a one dimensional nonsteady flow stream to be generated, economically from a steady flow source of compressed air. This nonsteady flow is used as the primary stream in a nonsteady flow ejector constituting part of the test equipment. Standard piezo-electric pressure transducers etc. allow local pressures to be studied, as functions of time, in both the primary and secondary (mixed) flow portions of the apparatus. Provision is also made for measuring the primary and secondary mass flows and the thrust generated. Sample results obtained with the equipment are presented. M.M.M.

N80-10126*# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
PRESSURE AND VELOCITY MEASUREMENTS IN A THREE-DIMENSIONAL WALL JET
G. D. Catalano, J. B. Morton (Virginia Univ.), and R. R. Humpris (Virginia Univ.) *In* NASA. Ames Res. Center Workshop on Thrust Augmenting Ejectors Sep. 1979 p 357-362 refs Presented at the AIAA 17th Aerospace Sciences Meeting, New Orleans, 15-17 Jan. 1979 (For primary document see N80-10107 01-02)
(Grants NGR-47-005-219; NSF 7522488)
Avail: NTIS HC A22/MF A01 CSCL 01A

The effects on the flow fields of varying the ratio of the velocity at the exit plane of the nozzle to the outer tunnel flow are reported. The pressure-velocity correlations are taken and some trends are discussed. Emphasis is placed on comparing the coherence between the fluctuating pressure and velocity fields at various locations in the different flow configurations. M.M.M.

N80-10127*# Flight Dynamics Research Corp., Van Nuys, Calif.
CONSIDERATIONS OF SOME CRITICAL EJECTOR PROBLEMS
Morton Alperin and Jiunn-Jeng Wu *In* NASA. Ames Res. Center Workshop on Thrust Augmenting Ejectors Sep. 1979 p 363-384 refs (For primary document see N80-10107 01-02)
Avail: NTIS HC A22/MF A01 CSCL 01A

Some aspects of ejector design and application, including, three dimensional effects and cross flow effects are presented. M.M.M.

N80-10128*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COANNULAR SUPERSONIC EJECTOR NOZZLES
Allan R. Bishop *In* NASA. Ames Res. Center Workshop on Thrust Augmenting Ejectors Sep. 1979 p 385-396 refs (For primary document see N80-10107 01-02)
Avail: NTIS HC A22/MF A01 CSCL 01A

The nozzles described exhibit a flow field which is supersonic except for the initial flow region, and the secondary mass flow is typically about five percent of the primary core flow. The features to improve the accuracy of the performance calculations are discussed. A special calculation is made to get as realistic a sonic line as possible for this geometry, using an analysis developed by Brown. The mixing between the secondary and core flows is treated to account for entrainment of the secondary flow into core. Both of these phenomena directly affect the pressure distribution on the shroud and therefore, the thrust that the nozzle produces. The importance of using a realistic sonic line and a mixing analysis is stressed. M.M.M.

N80-10129*# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio. Aeromechanics Div.
INTERFACE CONCERNS OF EJECTOR INTEGRATION IN V/STOL AIRCRAFT
Randall B. Lowry *In* NASA. Ames Res. Center Workshop on Thrust Augmenting Ejectors Sep. 1979 p 397-415 (For primary document see N80-10107 01-02)
Avail: NTIS HC A22/MF A01 CSCL 01A

A number of areas which have in the past contributed to weight, complexity, and thrust losses in the ejector-powered V/STOL vehicle were identified. Most of these interfaces taken singly do not represent a severe compromise to the vehicle; however, the bottom line is that the sum of compromises and the subsequent effects on performance, flight operations and maintenance have rendered the ejector V/STOL aircraft unattractive. In addition to some of the unique ejector/aircraft integration problems, the vehicle by virtue of having a V/STOL capability, is compromised in other areas. To be successful and acceptable, the advantages must outweight the disadvantages and simplicity with minimum penalties must be the rule. It is concluded that more emphasis must be placed on the ejector/aircraft interface for the concept to be successful. R.E.S.

N80-10130*# Lockheed-California Co., Burbank.
REACTION CONTROL SYSTEM AUGMENTATION FOR V/STOL AIRCRAFT
H. G. Streiff and R. E. Donham *In* NASA. Ames Res. Center Workshop on Thrust Augmenting Ejectors Sep. 1979 p 417-436 ref (For primary document see N80-10107 01-02)
Avail: NTIS HC A22/MF A01 CSCL 01A

Advantages and problems associated with augmentation of reaction controls are discussed. The current status of compact ejector technology and the expected performance of known efficient designs for reaction control applications are presented. R.E.S.

N80-10131*# Rockwell International Corp., Columbus, Ohio. Columbus Aircraft Div.
DESIGN AND TEST OF A PROTOTYPE SCALE EJECTOR WING
L. A. Mefferd, R. E. Alden, and P. M. Bevilacqua *In* NASA.

Ames Res. Center Workshop on Thrust Augmenting Ejectors Sep. 1979 p 437-448 (For primary document see N80-10107 01-02)
Avail: NTIS HC A22/MF A01 CSCL 01A

A two dimensional momentum integral analysis was used to examine the effect of changing inlet area ratio, diffuser area ratio, and the ratio of ejector length to width. A relatively wide range of these parameters was considered. It was found that for constant inlet area ratio the augmenation increases with the ejector length, and for constant length: width ratio the augmentation increases with inlet area ratio. Scale model tests were used to verify these trends and to examine th effect of aspect ratio. On the basis of these results, an ejector configuration was selected for fabrication and testing at a scale representative of an ejector wing aircraft. The test ejector was powered by a Pratt-Whitney F401 engine developing approximately 12,000 pounds of thrust. The results of preliminary tests indicate that the ejector develops a thrust augmentation ratio better than 1.65. R.E.S.

N80-10132*# De Havilland Aircraft Co. of Canada Ltd., Ottawa (Ontario).
THE EXTERNAL AUGMENTOR CONCEPT FOR V/STOL AIRCRAFT
D. C. Whittely *In* NASA. Ames Res. Center Workshop on Thrust Augmenting Ejectors Sep. 1979 p 449-471 refs (For primary document see N80-10107 01-02)
Avail: NTIS HC A22/MF A01 CSCL 01A

The beneficial aspects of an ejector powered V/STOL concept were reviewed. The feasibility of satisfactorily incorporating an ejector system in a high performance V/STOL aircraft was investigated. The external augmentor concept, based on the use of chordwise ejector slots, is presented. It is concluded that the external augmentor concept has a basic inherent simplicity and a sufficient augmentor performance potential to make feasible a high performance V/STOL aircraft based on ejectors. R.E.S.

N80-10133*# Naval Air Systems Command, Washington, D. C.
THE XFV-12A THRUST-AUGMENTED WING (TAW) PROTOTYPE AIRCRAFT
Ron Murphy and Ernest L. Lewis *In* NASA. Ames Res. Center Workshop on Thrust Augmenting Ejectors Sep. 1979 p 473-480 (For primary document see N80-10107 01-02)
Avail: NTIS HC A22/MF A01 CSCL 01A

The XFV-12A, a unique V/STOL technology prototype aircraft being developed for the Navy, is described. The innovative design features a thrust augmented wing and a canard ejector. Structural, functional, and control test performances are discussed. Static tether test results are also discussed. Assessment of test results are given along with projections for future modification areas. R.E.S.

N80-10134*# Douglas Aircraft Co., Inc., Long Beach, Calif.
***AN EFFICIENT USER-ORIENTED METHOD FOR CALCULATING COMPRESSIBLE FLOW IN AN ABOUT THREE-DIMENSIONAL INLETS* Final Report, Nov. 1977 - Apr. 1979**
John I. Hess, Dun-Pok Mack, and Norbert O. Stockman (NASA. Lewis Res. Center) Apr. 1979 117 p refs
(Contract NAS3-21135)
(NASA-CR-159578; MDC-J7733) Avail: NTIS HC A06/MF A01 CSCL 01A

A panel method is used to calculate incompressible flow about arbitrary three-dimensional inlets with or without centerbodies for four fundamental flow conditions: unit onset flows parallel to each of the coordinate axes plus static operation. The computing time is scarcely longer than for a single solution. A linear superposition of these solutions quite rigorously gives incompressible flow about the inlet for any angle of attack, angle of yaw, and mass flow rate. Compressibility is accounted for by applying a well-proven correction to the incompressible flow. Since the computing times for the combination and the compressibility correction are small, flows at a large number of inlet operating conditions are obtained rather cheaply. Geometric input is aided by an automatic generating program. A number of graphical output features are provided to aid the user, including surface streamline tracing and automatic generation of curves of curves of constant pressure, Mach number, and flow inclination at selected inlet cross sections. The inlet method and use of the program are described. Illustrative results are presented. A.R.H.

N80-10135*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LOW-SPEED WIND-TUNNEL TESTS OF A 1/10-SCALE* MODEL OF AN ADVANCED ARROW-WING SUPERSONIC CRUISE CONFIGURATION DESIGNED FOR CRUISE AT *MACH 2.2
Long P. Yip Aug. 1979 265 p refs
(NASA-TM-80152) Avail: NTIS HC A12/MF A01 CSCL 01A

The low-speed longitudinal and lateral-directional characteristics of a scale model of an advanced arrow-wing supersonic cruise configuration were investigated in tests conducted at a Reynolds number of 4.19 x 10 to the 6th power based on the mean aerodynamic chord, with an angle of attack range from -6 deg to 23 deg and sideslip angle range from -15 deg to 20 deg. The effects of segmented leading-edge flaps, slotted trailing-edge flaps, horizontal and vertical tails, and ailerons and spoilers were determined. Extensive pressure data and flow visualization pictures with non-intrusive fluorescent mini-tufts were obtained. A.R.H.

N80-10136*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A FLIGHT INVESTIGATION OF PERFORMANCE AND LOADS FOR A HELICOPTER WITH NLR-1T MAIN-ROTOR BLADE SECTIONS
Charles E. K. Morris, Jr., Robert L. Tomaine, and Dariene D. Stevens Oct. 1979 176 p refs Prepared in cooperation with Army Research and Technology Labs., Hampton, Va.
(DA Proj. 1L2-62209-AH-76)
(NASA-TM-80165) Avail: NTIS HC A09/MF A01 CSCL 01A

Data on performance and rotor loads for a teetering-rotor, AH-1G helicopter flown with a main rotor that had the NLR-1T airfoil as the blade-section contour are presented. The test envelope included hover, forward-flight speed sweeps from 35 to 85 m/sec, and collective-fixed maneuvers at about 0.25 tip-speed ratio. The data set for each test point described vehicle flight state, control positions, rotor loads, power requirements, and blade motions. Rotor loads are reviewed primarily in terms of peak-to-peak and harmonic content. Lower frequency components predominated for most loads and generally increased with increased airspeed, but not necessarily with increased maneuver load factor. M.M.M.

N80-10137*# Michigan Univ., Ann Arbor. Dept. of Aerospace Engineering.
MATH MODELING AND COMPUTER MECHANIZATION FOR REAL TIME SIMULATION OF ROTARY-WING AIRCRAFT *Final Report, 1 Jun. 1977 - 31 Mar. 1979*
Robert M. Howe Mar. 1979 21 p refs
(Grant NsG-2245)
(NASA-CR-162400) Avail: NTIS HC A02/MF A01 CSCL 01A

Mathematical modeling and computer mechanization for real time simulation of rotary wing aircraft is discussed. Error analysis in the digital simulation of dynamic systems, such as rotary wing aircraft is described. The method for digital simulation of nonlinearities with discontinuities, such as exist in typical flight control systems and rotor blade hinges, is discussed. A.W.H.

N80-10138# Naval Surface Weapons Center, White Oak, Md.
OBSERVATIONS ON PARACHUTE SCALE FACTORS FOR MODELING PARACHUTE DEPLOYMENT AND STEADY STATE PERFORMANCE Final Report, 1978
William P. Ludtke 9 May 1979 64 p
(AD-A070571; NSWC/WOL/TR-78-189) Avail: NTIS HC A04/MF A01 CSCL 01/3

A new approach to the scaling of parachute performance is presented, based upon variables inherent in the inflation process such as weight, time, geometry, etc. Limitations of conventional scaling parameters such as Reynold's, Froude, and Mach numbers as applied to parachutes are discussed. Examples of parachute inflation and steady state performance are correlated

with a scale factor designated as a Mass Ratio, which is the ratio of the system mass to a mass of atmosphere associated with the parachute size, inflation time, altitude and deployment velocity. For advanced opening shock analyses, the concept of variable mass ratio during canopy inflation is proposed, and the effects of partial canopy inflation at suspension line stretch are discussed. Although, the solid cloth types of parachutes are primarily used as examples, the ideas of mass ratio, initial area, and analysis techniques are applicable to all types of parachutes. GRA

N80-10139# Tennessee Technological Univ., Cookeville. Dept. of Engineering Science and Mechanics.
USE OF WAGNER FUNCTIONS IN AIRFOIL DESIGN OPTIMIZATION Final Report, 20 Mar. 1978 - 19 Mar. 1979
Vireshwar Sahai and Chen-Pierce Tsao May 1979 57 p refs
(Grant AF-AFOSR-3543-78; AF PROJ. 2307)
(AD-A072634; TTU-ESM-79-2; AFOSR-79-0903TR) Avail: NTIS HC A04/MF A01 CSCL 01/3

The feasibility of using a series of Wagner functions to represent airfoil contours in design procedures was investigated. It was demonstrated that a large class of airfoils can be adequately described by a relatively small number of terms. A least squares type of procedure was used to determine the unknown coefficients in the series representation. The use of Wagner function representation in thin symmetrical airfoil design was investigated. Both the direct method of analysis in which the velocity distribution is calculated for a known shape and the inverse method of design in which the airfoil shape corresponding to a specified velocity distribution is determined were considered. Standard airfoil data was used to test the suitability of the Wagner function representation, and the results were found to be satisfactory. Rapid calculations were possible even in the inverse mode since the use of Wagner functions allowed the determination of all the improper integrals that appear in thin airfoil theory in closed form. GRA

N80-10140# Analytical Methods, Inc., Bellevue, Wash.
PREDICTION OF AERODYNAMIC CHARACTERISTICS OF FIGHTER WINGS AT HIGH LIFT Interim Report, 1 Jan. - 31 Dec. 1978
Baluzu M. Rao, Brion Maskew, and Frank A. Dvorak 31 Dec. 1978 57 p refs
(Contract N00014-78-C-0128; RR0141184)
(AD-A072630; ONR-CR215-258-1) Avail: NTIS HC A04/MF A01 CSCL 20/4

A basic viscous/potential flow iterative technique is developed for calculating flow on finite wings up to and beyond the stall. The procedure used is a direct adaptation and extension of successfully validated Analytical Methods, Inc. (AMI) two-dimensional CLMAX separation model to three-dimensional flows. In the potential flow program, the lifting surface is divided into a number of panels with linear and constant vorticity distributions along the chordwise and spanwise directions, respectively. The separation region is modeled in the potential flow analysis using force-free vortex sheets which require an inner iteration to establish their shapes. The program generates a new wake shape using the new separation locations together with the information from the previous iteration and the process is repeated until a convergent solution is obtained. In order to expedite the development process, several simplifying assumptions are made. However, these assumptions do not conflict with the primary objective of the present investigation which is to demonstrate the feasibility of extending the two-dimensional CLMAX separation model to three-dimensional flows. The separation flow model and the developed computer program are validated by comparing the results with wind tunnel test data for some simple cases. GRA

N80-10141# Dayton Univ. Research Inst., Ohio.
THE MARTIN-LOMAX ITERATION FOR THE COMPUTATIONS OF TRANSONIC FLOW FIELDS: SOME OBSERVATIONS Interim Report, Apr. - Nov. 1978
Karl G. Guderley and Donald S. Clemm Wright-Patterson AFB, Ohio AFFDL Apr. 1979 56 p refs
(Grant AF-AFOSR-78-3524; AF Proj 2304)
(AD-A072523; AFFDL-TR-79-3023) Avail: NTIS HC A04/MF A01 CSCL 20/4

The iteration method of Martin and Lomax for the computation of transonic flow fields is applied to some linear examples (subsonic flows, supersonic flows, and flows with a shock). In these examples a Fourier decomposition can be made in one coordinate direction, and one is left with a one-dimensional difference equation. The question of compatibility of the boundary conditions pertaining to the elliptic operator used in the Martin-Lomax iteration, with those of a hyperbolic problem is discussed. The one-dimensional difference procedure gives rise to a linear eigenvalue problem. The distribution of the eigenvalues and the form of the eigenvectors explains the convergence behavior of solutions obtained with different initial which occur in the influence of certain arbitrary parameters which occur in the Martin-Lomax procedure is briefly discussed. An attempt is made to improve the convergence of the iterations by the application of Aitken-Shanks formulae of different orders. A direct derivation of the concept underlying these formulae is given. In the present examples, the Aitken-Shanks extrapolation failed to accelerate the convergence. GRA

N80-10142# New York Univ., N. Y. Courant Inst. of Mathematical Sciences.
ACCELERATION OF TRANSONIC POTENTIALS FLOW CALCULATIONS ON ARBITRARY MESHES BY THE MULTIPLE GRID METHOD
Antony Jameson 1979 33 p refs Presented at the AIAA Computational Fluid Dynamics Conf., Williamsburg, 4 Jul. 1979
(Contract N00014-77-C-0032)
(AD-A072301) Avail: NTIS HC A03/MF A01 CSCL 20/4

The paper describes a multiple grid method for transonic flow calculations. The proposed scheme incorporates a generalized alternating direction method as the smoothing algorithm. Numerical experiments with this multigrid alternating direction (MAD) method indicate that it is both fast and reliable. GRA

N80-10143# Aeronautical Research Inst. of Sweden, Stockholm.
INVESTIGATION OF THE BOUNDARY CONDITION AT A WIND TUNNEL TEST SECTION WALL FOR A LIFTING WING-BODY MIDEL AT LOW SUPERSONIC SPEED Final Report, 1 Apr. 1977 - 31 Mar. 1979
Sven-Grik Nyuberg, Sevn G. Hedman, Arthur Rizzi, and Hans Sorenson May 1979 99 p refs
(Grant AF-AFOSR-3282-77; AF Proj. 2307)
(AD-A072098; AFOSR-79-0868TR) Avail: NTIS HC A05/MF A01 CSCL 01/3

The purpose of the investigation is to study theoretically and experimentally at low supersonic speed the interference-free flow field around a lifting wing-body wind tunnel model at locations where the tunnel walls are normally situated. The undisturbed flow properties are used to establish criteria for cross flow characteristics of wave-attenuating ventilated wind tunnel walls. The flow field has been calculated theoretically by a relaxation method based on the transonic small perturbation (TSP) equation and for one sample case for the body alone with a method based on the solution of the full gas dynamic equations (the Euler equations) in a time-dependent finite volume formulation. A survey of the flow has been made experimentally with a probe in wind tunnel tests. Pressure and flow deflection in the flow field near a delta-wing-body configuration have been calculated at free stream Mach number 1.2 and at angles of attack of 0 deg and 5 deg. The same properties have been determined in wind tunnel tests at Mach number 1.15, 1.20 and 1.30 and at nominal angles of attack 0 deg, 5 deg, 15 deg and 25 deg. The theoretical results obtained using the TSP method show only qualitative agreement with experimental data and the shocks are smeared out. Theoretical results obtained by the time-dependent finite volume method for the body alone show promising agreement with experiments. GRA

N80-10144# Sandia Labs., Albuquerque, N. Mex.
ACCELERATED AGING OF PARACHUTE MATERIALS
J. A. Wagner, K. E. Mead, I. Auerbach, and R. H. Ericksen 1979 6 p refs Presented at JOWOG-28, Albuquerque, N. Mex., 11 Jun. 1979
(Contract DE-AC04-76DP-00789)
(SAND-79-0894C; Conf-790632-3) Avail: NTIS HC A02/MF A01

Parachutes with intended lifetimes of twenty to twenty-five years are tested for real time life storage. An accelerated aging program to test the nylon and Kevlar yarns used in the manufacture of parachute materials is described. The yarns were tested for breaking strength in humidity, ozone, and smog environments.
A.W.H.

N80-10145# New Mexico Univ., Albuquerque. Technology Application Center.
BOUNDARY LAYER CONTROL. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE
Report, 1974 - Jul. 1979
Samuel C. Mauk Springfield, Va. NTIS Aug. 1979 34 p Sponsored by NTIS
(NTIS/PS-79/0812/2) Avail: NTIS HC $28.00/MF $28.00 CSCL 01A

Citations to the international literature concerning boundary layer control are reported. Topics covered include suction, blowing, shock wave interaction, magnetohydrodynamic flow, laminar boundary layer cooling, gas and fluid inuection, and circulation control as methods of boundary layer control. This bibliography contains 134 citations.
GRA

N80-10146# New Mexico Univ., Albuquerque. Technology Applications Center.
BOUNDARY LAYER SEPARATION. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE
Report, 1970 - Jul. 1979
Samuel C. Mauk Springfield, Va. NTIS Aug. 1979 54 p Sponsored by NTIS
(NTIS/PS-79/0813/0) Avail: NTIS HC $28.00/MF $28.00 CSCL 01A

Citations to the international literature concerning boundary layer separation in both laminar and turbulent boundary layers are reported. Articles covering incompressible, transonic and supersonic flown conditions are included. Also included are articles concerning separated flow, shock wave interaction boundary layer equations, pressure gradients, and three dimensional boundary layers. Contained are 217 citations.
GRA

N80-10147# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
TECHNICAL EVALUATION REPORT ON THE FLUID DYNAMICS PANEL SYMPOSIUM ON HIGH ANGLE OF ATTACK AERODYNAMICS
Edward C. Polhamus Aug. 1979 20 p refs Symp. held at Sandefjord, Norway, 4-6 Oct. 1978 Prepared in cooperation with NASA, Langley Res. Center
(AGARD-AR-145; ISBN-92-835-1334-7) Avail: NTIS HC A02/MF A01

An overview is presented of 32 formal papers and 7 open session papers. Topics covered include: (1) studies of configurations of practical interest; (2) mathematical modelling and supporting investigations of slender wings, bodies of revolution, and body-wing configurations; (3) design methods; and (4) air intakes.
A.R.H.

N80-10002 Allerton Press, Inc., New York, N. Y.
APPLICATION OF THE GAS FLOW DIMENSIONLESS CHARACTERISTICS METHOD FOR EXPERIMENTAL STUDY OF SONIC NOZZLES
G. V. Abalakov, B. S. Vinogradov, and A. P. Gerasimov *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 1-5 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 5-11 (For primary document see N80-10001 01-01)
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N80-10018 Allerton Press, Inc., New York, N. Y.
EXPERIMENTAL STUDY OF THE TURBULENT WAKE DOWNSTREAM OF A FAN JET
O. A. Khachaturyan *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 72-77 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats Tekh. (USSR), v. 21, no. 3, 1978 p 100-107 (For primary document see N80-10001 01-01)
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N80-10025 Allerton Press, Inc., New York, N. Y.
STUDY OF RADIAL DIFFUSORS WITH FLOW SWIRL
V. T. Volov and V. G. Shakhov *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 111-112 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 148-150 (For primary document see N80-10001 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Ave., N.Y. 10011; $45.00

N80-10038 Allerton Press, Inc., New York, N. Y.
ANALOG MODELING IN STUDYING SUPERSONIC FLOW AROUND A WING AND ITS GOVERNING ANALOG-CRITERIA
R. I. Vinogradov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 32-37 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4 1978 p 43-48 (For primary document see N80-10031 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Avenue, New York, N.Y. 10011; $45.00

N80-10045 Allerton Press, Inc., New York, N. Y.
LAMINAR BOUNDARY LAYER CALCULATION FROM EXPERIMENTAL PRESSURE DISTRIBUTION
V. D. Osorgin, A. N. Popkov, O. P. Sidorov, and S. O. Sidorova *In its* Soviet Aeron., v. 21, no. 4, 1978 p 67-71 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 88-93 (For primary document see N80-10031 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Avenue, New York, N.Y. 10011; $45.00

N80-10050 Allerton Press, Inc., New York, N. Y.
MOTION OF RECTANGULAR WING BETWEEN PARALLEL WALLS
K. V. Rozhdestvenskii *In its* Soviet Aeron., v. 21, no. 4, 1978 p 92-97 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 117-123 (For primary document see N80-10031 01-01)
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N80-10059 Allerton Press, Inc., New York, N. Y.
PARACHUTE-ROCKET DECELERATION SYSTEM DESIGN
V. N. Semenov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 132-134 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviat. Tekh., (USSR), v. 21, no. 4, 1978 p 158-162 (For primary document see N80-10031 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Avenue, New York, N.Y. 10011; $45.00

N80-10060 Allerton Press, Inc., New York, N. Y.
FLOW-AROUND SMALL-ASPECT-RATIO DELTA WING WITH VORTEX "BURSTING"
G. A. Cheremukhin, E. A. Trunevs, and E. Ya. Pivkin *In its* Soviet Aeron., v. 21, no. 4, 1978 p 135-140 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 162-167 (For primary document see N80-10031 01-01)
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N80-10062 Allerton Press, Inc., New York, N. Y.
CALCULATION OF WORKING PROCESS IN SLOW-COMPRESSION PISTON-TYPE AERODYNAMIC TUBE
A. B. Berezovskii and V. B. Panfilovich *In its* Soviet Aeron., v. 22, no. 1 1979 p 1-5 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 3-10 (For primary document see N80-10061 01-01)
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N80-10077 Allerton Press, Inc., New York, N. Y.
AERODYNAMIC EFFICIENCY OF GAS TURBINE INTAKE DUCT
I. G. Gogolev, P. V. Korolev, Yu. D. Kudashev, V. A. Magala, and B. A. Shifrin *In its* Soviet Aeron., v. 22, no. 1 1979 p 71-73 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 88-91 (For primary

document see N80-10061 01-01)
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N80-10079 Allerton Press, Inc., New York, N. Y.
DESIGN OF BOUNDARY-LAYER AIR INTAKES
V. T. Kalugin, T. V. Klebanova, Yu. I. Kozlov, and V. N. Koshevoi *In its* Soviet Aeron., v. 22, no. 1 1979 p 76-79 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 93-96 (For primary document see N80-10061 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Ave., New York, N. Y. 10011; $50.00

N80-10082 Allerton Press, Inc., New York, N. Y.
APPLICATION FACTOR OF TWO-DIMENSIONAL TRANSVERSE SONIC JET INTERACTING WITH SUPERSONIC STREAM
V. I. Krishtal *In its* Soviet Aeron., v. 22, no. 1 1979 p 87-89 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 102-105 (For primary document see N80-10061 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Ave., New York, N. Y. 10011; $50.00

N80-10085 Allerton Press, Inc., New York, N. Y.
STUDY OF COMBINED OPERATION OF SELF-EVACUATING VORTEX TUBE WITH DIFFUSER
A. P. Merkulov and V. T. Volov *In its* Soviet Aeron., v. 22, no. 1 1979 p 96-98 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 109-112 (For primary document see N80-10061 01-01)
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03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N80-10148*# Northwestern Univ., Evanston, Ill. Transportation Center.
FACTORS AFFECTING THE RETIREMENT OF COMMERCIAL TRANSPORT JET AIRCRAFT
Frank A. Spencer Aug. 1979 296 p refs
(Grant NsG-2149)
(NASA-CR-152308) Avail: NTIS HC A13/MF A01 CSCL 01C

The historical background of the technology and economics of aircraft replacement and retirement in the prejet era is reviewed in order to determine whether useful insights can be obtained applicable to the jet era. Significant differences between the two periods are noted. New factors are identified and examined. Topics discussed include concern over current policies regarding deregulation, regulatory reform, and retroactive noise regulations; financing and compliance legislation; aging; economic environment and inflation; technological progress; fuel efficiency and cost; and a financial perspective of replacement decisions. A.R.H.

N80-10149*# Douglas Aircraft Co., Inc., Long Beach, Calif.
CARGO LOGISTICS AIRLIFT SYSTEMS STUDY (CLASS). VOLUME 4: FUTURE REQUIREMENTS OF DEDICATED FREIGHTER AIRCRAFT TO YEAR 2008
R. J. Burby Oct. 1979 259 p refs
(Contract NAS1-14948)
(NASA-CR-158950-Vol-4) Avail: NTIS HC A12/MF A01 CSCL 01C

The 1978 fleet operations are extended to the year 1992, thus providing an evaluation of current aircraft types in meeting the ensuing increased market demand. Possible changes in the fleet mix and the resulting economic situation are defined in terms of the number of units of each type aircraft and the resulting growth in operational frequency. Among the economic parameters considered are the associated investment required by the airline, the return on investment to the airline, and the accompanying levels of cash flow and operating income. Against this background the potential for a derivative aircraft to enter fleet operations in 1985 is defined as a function of payload size and as affected by 1980 technology. In a similar manner, the size and potential for a new dedicated 1990 technology, freighter aircraft to become operational in 1995 is established. The resulting aircraft and fleet operational and economic characteristics are evaluated over the period 1994 to 2008. The impacts of restricted growth in operational frequency, reduced market demand, variations in aircraft configurations, and military participation, are assessed. A.R.H.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N80-10150*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
NAVIGATION AND METEOROLOGICAL ERROR EQUATIONS FOR SOME AERODYNAMIC PARAMETERS
Michael J. Krikorian, John Rice, and Paul Mitchell Aug. 1979 37 p
(NASA-TM-80804; Rept-77-FM-30; JSC-16074) Avail: NTIS HC A03/MF A01 CSCL 17G

Mathematical equations for the analysis of the errors that are expected in a set of postflight aerodynamic parameters are presented. The errors are due to inaccuracies in the Shuttle best estimate trajectory and in the meteorological data obtained in support of the flights. The error analysis shows that the parameter vector, Z, and its associated error covariance matrix, C sub Z, is calculated from a given state vector, X, and its associated covariance matrix, C sub X. A.W.H.

N80-10151*# Civil Aeromedical Inst., Oklahoma City, Okla.
PILOT PERFORMANCE DURING SIMULATED APPROACHES AND LANDINGS MADE WITH VARIOUS COMPUTER-GENERATED VISUAL GLIDEPATH INDICATORS
Mark F. Lewis and Henry W. Mertens Sep. 1978 58 p refs
(AD-A066220; FAA-AM-79-4) Avail: NTIS HC A04/MF A01 CSCL 17/7

The effectiveness, in terms of pilot performance, of four different visual glidepath indicator systems in severely reduced nighttime visual environment is discussed. An aircraft simulator was used with a computer generated image visual system attached for visual simulation of the airport scene. The flight path profile with regard to altitude deviations from a 3 degree path as a function of distance is examined. The instability in approach paths flown with the different types of glidepath indicators is studied. Altitude deviations from the 3 degree glidepath as a function of indicator type, trials, and subjects are analyzed. A.W.H.

N80-10152*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ALGORITHMS AND LOGIC FOR INCORPORATING ILS NASA TCV B-737 AIRPLANE AREA NAVIGATION SYSTEM
Charles E. Knox Sep. 1979 23 p refs
(NASA-TM-80167) Avail: NTIS HC A02/MF A01 CSCL 17G

The algorithms and logic for use in the implementation of instrument landing system (ILS) localizer deviation signals for the generation of navigation and guidance information are presented. The navigation position estimates, based on range information from a randomly chosen distance measuring

equipment (DME) and ILS localizer deviation information, are illustrated. The ILS volumetric coverage and DME geometric checks are described and their addition to area navigation systems with minimum software modification are discussed.
A.W.H.

N80-10153# Federal Aviation Administration, Washington, D. C. Office of Aviation Policy.
IFR AIRCRAFT HANDLED FORECAST BY AIR ROUTE TRAFFIC CONTROL CENTER, FISCAL YEARS 1979-1990
Bernard Hannan Apr. 1979 54 p
(AD-A070786; FAA-AVP-79-1) Avail: NTIS HC A04/MF A01 CSCL 01/2

The forecasts of instrument flight rule aircraft handled by air route traffic control centers. The forecasts show that total aircraft handled will increase from 28.1 million in 1978 to 45.6 million in 1990. These numbers along with those for the intervening years are broken down by region and by each air route traffic control center.
A.W.H.

N80-10154# Advisory Group for Aerospace Research and Development, Paris (France).
PRINCIPLES AND OPERATIONAL ASPECTS OF PRECISION POSITION DETERMINATION SYSTEMS
Cornelius T. Leondes, ed. (Calif. Univ., Los Angeles.) Jul. 1979 472 p refs
(AGARD-AG-245; ISBN-92-835-1330-4) Avail: NTIS HC A20/MF A01

Reports are presented concerning the current status of radio navigation, the Global Positioning System, and the Joint Tactical Information Distribution System. For individual titles, see N80-10155 through N80-10191.

N80-10155# Systems Control, Inc., Palo Alto, Calif.
RADIO NAVIGATION SYSTEMS: CURRENT STATUS
James S. Tyler and Fred G. Karkalik *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems Jul. 1979 35 p refs (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

The life-cycle costs, user requirements, and current system capabilities of radio navigation systems are addressed. The life-cycle costs of several system scenarios are first presented for a limited segment of civil air users in order to illustrate the large magnitude of the costs involved. Current user requirements are summarized for air and marine civil users. Finally, the technical characteristics and operational status of several current systems are presented, namely, Loran-A, Loran-C, Omega, Decca, VOR/DME, and TACAN.
F.O.S.

N80-10156# Magnavox Government and Industrial Electronics Co., Torrance, Calif. Advanced Products Div.
TRANSIT: THE CURRENT SATELLITE NAVIGATION SYSTEM
Thomas A. Stansell, Jr. *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems Jul. 1979 41 p refs (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

An in-depth review is provided of Transit, the Navy Navigation Satellite System, from the user's point of view. After a brief system description, a spectrum of diverse applications is described, ranging from the navigation of fishing boats to guiding submarines. Next, the Transit system status and its vitality are discussed. It becomes clear that the system is exceptionally reliable and trustworthy, that the use of and the investment in Transit equipment is growing at a remarkable rate, and that the basic system is about to be improved by the addition of a new generation of NOVA satellites. A technical description is presented of the position fix process and of the factors which influence accuracy. The satellite signal structure, the meaning of the navigation message, and the interpretation of the Doppler measurements are covered in detail, followed by an overview of the fix calculation process. Finally, a thorough review of the system accuracy potential and of the factors which determine accuracy performance is given.
F.O.S.

N80-10157# Naval Research Lab., Washington, D. C. Space Applications Branch.
THE TIMATION NAVIGATION SATELLITES
Roger L. Easton *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems Jul. 1979 3 p (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

The development of stable RF oscillators in the two post World War II decades was essential to the design of passive ranging navigation systems. Early involvement of the U. S. Naval Research Laboratory in this method of time synchronized navigation is outlined. The first NRL satellite used to validate the concept was launched in 1967. Both, it and the second satellite used quartz crystal oscillators. The two following satellites use rubidium and cesium standards, respectively. The lessons learned from the early satellites are summarized, and the merger of TIMATION into the NAVSTAR Global Positioning System Program is described. Selected experimental results from NTS-1 and 2 are analyzed and the plans for NTS-3 are outlined.Author

N80-10158# Rockwell International Corp., Downey, Calif. Space Div.
PRINCIPLE OF OPERATION OF NAVSTAR AND SYSTEM CHARACTERISTICS
Robert J. Milliken and Curt J. Zoller *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems Jul. 1979 12 p refs (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

The NAVSTAR/Global Positioning System (GPS) will provide extremely accurate three-dimensional position and velocity information to users anywhere in the world. The position determinations are based on the measurement of the transit time of RF signals from four satellites of a total constellation of 24. Accuracies on the order of 10 meters may be anticipated. The basic technique by which the system operates, the navigation signal, the measurement of the transit time, error sources, accuracies, and other characteristics of the system are discussed.
F.O.S.

N80-10159# Stanford Telecommunications, Inc., Sunnyvale, Calif.
GLOBAL POSITIONING SYSTEM: SIGNAL STRUCTURE AND PERFORMANCE CHARACTERISTICS
James J. Spilker, Jr. *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems Jul. 1979 35 p refs (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

Details of the Global Positioning System (GPS) signal structure are discussed in relation to the signal generation and the performance of the navigation system. The GPS performance objectives, orbit geometry, and propagation effects are summarized in order to gain better understanding of the signal and what characteristics it must provide. With these performance objectives as a preface, the details of the signal are described, showing the details of the dual frequency transmission and both the precise (P) and clear/acquisition (C/A) codes and their characteristics. Finally, the basic performance of simplified receivers operating on this received signal is discussed in order to show compatibility with the original performance objectives and typical receiver operation. It is shown that an rms position error of less than 10 meters is well within the achievable performance bounds of the system.
J.M.S.

N80-10160# ADVAND Systems Engineering, San Diego, Calif.
THE GPS NAVIGATION MESSAGE
A. J. VanDierendonck, S. S. Russell (Gen. Dyn./Electron., San Diego, Calif.), and E. R. Kopitske (Magnavox Res. Labs., Torrance, Calif.) *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems Jul. 1979 21 p refs (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

The Global Positioning System (GPS) navigation message design process included numerous trade studies which weighed various representations and algorithms against variables such as message size, accuracy, update frequency, user computational requirements, and legacy for the operational GPS. Other factors such as graceful degradation and future user requirements were also considered. Finally, upon selecting the appropriate design structure, the design was fine tuned to its final form and user algorithm implementation trade-offs were performed. The

representational algorithms and user algorithms were jointly tested using a simulated space vehicle ephemeris trajectory and space vehicle clock. The results of these tests demonstrate that the user models represent the simulated ephemeris and clock to within 0.01 meters with precise parameters, and to within 0.1 meters with truncated parameters. J.M.S.

N80-10161# Naval Research Lab., Washington, D. C. Space Systems Div.

CLOCKS: EVOLUTION OF FREQUENCY STANDARDS

C. A. Bartholomev *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems Jul. 1979 11 p refs (For primary document see N80-10154 01-04)

Avail: NTIS HC A20/MF A01

The development of clock technology to meet the changing requirements of satellite navigation systems is discussed. The sequence of flight experiments from Timation 1 launched in 1967 to the multihundred watt Navigation Technology Satellites 1, 2, and 3 of the Global Positioning System is traced. J.M.S.

N80-10162# ADVAND Systems Engineering, San Diego, Calif.

GPS TIME

A. J. VanDierendonck *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems Jul. 1979 10 p refs (For primary document see N80-10154 01-04)

Avail: NTIS HC A20/MF A01

The control and distribution of Global Positioning System (GPS) time measurements is discussed. Compatibility with other timing and navigation systems, 'fast' user acquisition of GPS 'P' signals, and continuous user navigation accuracy are among the factors included. J.M.S.

N80-10163# General Dynamics/Electronics, San Diego, Calif.

MASTER CONTROL STATION

M. J. Hurley, J. L. Kramer, and D. D. Thornburg *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems Jul. 1979 8 p (For primary document see N80-10154 01-04)

Avail: NTIS HC A20/MF A01

Phase 1 of the GPS navigation satellite effort is described. The control segment generates the data required by the user to obtain a navigation solution, uploads this data into the satellite processor for transmission to the user, and collects the satellite ranging data required to determine the satellite ephemeris and clock performance parameters. The control segment software mechanization to perform these functions is a file-based, multi-tasked architecture. This architecture and its legacy to future phases of GPS are described. J.M.S.

N80-10164# General Dynamics/Electronics, San Diego, Calif.

GPS MASTER CONTROL STATION OPERATIONS

H. C. Johnson *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems Jul. 1979 3 p (For primary document see N80-10154 01-04)

Avail: NTIS HC A20/MF A01

The operation and function of the control segment of the Global Positioning System is discussed. Satellite tracking, range measurements, estimates of the satellite's ephemerides, and periodic uploads of current data and downlink-formatting instructions to the satellite's onboard computer are among the factors covered. Performance of the computer system is evaluated. J.M.S.

N80-10165# General Dynamics/Electronics, San Diego, Calif.

MONITOR STATIONS

R. L. Harrington, W. A. Fabrizio, and E. Salinas *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems Jul. 1979 9 p (For primary document see N80-10154 01-04)

Avail: NTIS HC A20/MF A01

Monitor stations (MS) which are fixed tracking stations in the GPS control segment are described. Monitor stations collect space vehicle (SV) tracking data, downlink navigation message data, and station health and status. The functional relationship of the monitor stations to other parts of the system is discussed. GPS concept validation monitor stations are located at Vandenburg Air Force Base, Hawaii, Guam, and Alaska. R.E.S.

N80-10166# General Dynamics/Electronics, Vandenburg AFB, Calif.

THE GPS UPLOAD STATION

W. H. Harbour and M. Rochette *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems Jul. 1979 5 p (For primary document see N80-10154 01-04)

Avail: NTIS HC A20/MF A01

The GPS Upload Station (ULS) which provides the master control station (MCS) space uplink for the transmission of the navigation data payload to the GPS navigation satellites, is described. The ULS receives upload data messages from the MCS as well as additional data necessary to point the ULS antenna properly at the space vehicle selected for upload. The ULS computer hardware and software are described. R.E.S.

N80-10167# Stanford Telecommunications, Inc., Sunnyvale, Calif.

A TIME TRANSFER UNIT FOR GPS

Jackson T. Witherspoon and Leonard Schuchman *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems Jul. 1979 6 p refs (For primary document see N80-10154 01-04)

Avail: NTIS HC A20/MF A01

A time transfer unit for use with NAVSTAR satellites of the global positioning system (GPS) is described. This unit can provide worldwide time transfer with an accuracy of better than 100 nanoseconds relative to GPS system time. Techniques used for GPS signal processing and data reduction are summarized, and potential applications are discussed. R.E.S.

N80-10168# General Dynamics/Electronics, San Diego, Calif.

EPHEMERIS AND CLOCK DETERMINATION IN GPS

J. H. Schaibly and E. L. Lasley *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems Jul. 1979 7 p refs (For primary document see N80-10154 01-04)

Avail: NTIS HC A20/MF A01

The data processing performed at the GPS 'master control station' is described. Estimation/prediction techniques are given for determining satellite ephemeris and clock behavior. The evaluation of the techniques is also described. R.E.S.

N80-10169# Texas Instruments, Inc., Dallas.

TEXAS INSTRUMENTS PHASE 1 GPS USER EQUIPMENT

M. J. Borel, J. N. Damoulakis, D. R. Delzer, T. D. Fuchser, J. H. Hinderer, C. R. Johnson, and D. J. Pinkos *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems Jul. 1979 15 p refs (For primary document see N80-10154 01-04)

Avail: NTIS HC A20/MF A01

The design and fabrication of the Global Positioning System user equipment sets is described. The system concept and design permits maximum commonality between various system designs through the use of different quantities of common modules to satisfy specific performance requirements. Also, because of the functional nature of the modules, improvements to accommodate performance requirements were incorporated with minimum impact. Global positioning system user equipment consists of three different system types: the high dynamic user equipment used in high performance aircraft; the missile-borne receiver set used in the Minuteman missile test program; and the manpack/vehicular user equipment used in manned vehicles such as trucks, tanks, and jeeps. A comparison of the major performance requirements of these systems is presented. Additional information regarding the three systems is presented following a discussion of the receiver, the processor, and the navigation filter. R.E.S.

N80-10170# Magnavox Government and Industrial Electronics Co., Torrance, Calif. Advanced Products Div.

GPS RECEIVER OPERATION

Burton G. Glazer *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems Jul. 1979 5 p (For primary document see N80-10154 01-04)

Avail: NTIS HC A20/MF A01

Different receiver configurations which are suitable for applications having differing levels of dynamics of the most vehicle and interference environments, are described. All configurations are capable of accomplishing certain fundamental operations: satellite selection, signal acquisition, tracking and measurement

and data recovery. After correction for propagation effects, signal time-of-arrival measurements are used to obtain the navigation solution. The limits of the performance of the receivers are described. R.E.S.

N80-10171# Aerospace Corp., Los Angeles, Calif.
PHASE 2 GPS RECEIVER DESIGN PHILOSOPHY
Frank E. Butterfield and Robert E. Sung *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems Jul. 1979 9 p ref (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

The development of the Global Positioning System (GPS) User System Segment is discussed as well as the development objectives, program plan and a brief review of development activities. A discussion of user requirements, host vehicle interfaces and integration, definition of user equipment set configurations and the elements of a Design to Cost (DTC)/Life Cycle Cost (LCC) program is presented. The GPS Phase 2 User Equipment (UE) DTC/LCC program objectives and tasks required to accomplish these objectives are described. The modular design concept, which embraces the use of a limited inventory of standard function replaceable hardware and computer program or software modules to implement specific operational building blocks, to be uniquely arranged for the synthesis of differing UE sets, is presented along with the flexible interface module concept and the form, fit and function approach to integration. M.M.M.

N80-10172# Lincoln Lab., Mass. Inst. of Tech., Lexington.
PERFORMANCE ENHANCEMENT OF THE GPS RECEIVER BY DATA-FREE OPERATION
J. R. Sklar and L. L. Horowitz *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems Jul. 1979 6 p refs Sponsored by AF (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

The operation of a receiver designed to receive the signal transmitted by a Global Positioning System (GPS) satellite in the dynamic environment experienced by a high-performance tactical aircraft is presented. Because the GPS signal is modulated with system data, the signal energy is spread over a 50 Hz band; as a result, there is a limit to the noise filtering that can be performed. If this data were removed, or (equivalently) stored in the receiver, additional filtering could be employed and other changes made in the receiver to improve the noise (and/or jamming) immunity. The quantitative effects of these changes are derived. M.M.M.

N80-10173# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
INTEGRATION OF GPS WITH INERTIAL NAVIGATION SYSTEMS
Duncan B. Cox, Jr. *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems 1979 10 p refs (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

Benefits and means of integrating GPS and inertial systems are described. Emphasis was placed on the data to be transferred and the operations to be performed in attaining varying degrees of integration. An understanding of the mechanisms and degrees of complexities involved was given, as well as a perspective on the technical issues that are involved in the integration problem. It was concluded that very substantial performance improvements can be obtained through integration of GPS and inertial systems in comparison to what can be achieved by either system alone. Some of the improvements are only achieved through substantial increases in system complexity. M.M.M.

N80-10174# Teledyne Systems Co., Northridge, Calif.
APPLICATION OF GPS TO LOW COST TACTICAL WEAPONS
A. F. Schmitt and J. J. Bowden *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems 1979 10 p refs (For primary document see N80-10154 01-04)
(Contract F08635-76-C-0343)
Avail: NTIS HC A20/MF A01

A navigation receiver employing the Global Positioning System (GPS) navigation satellites' signals is described which capitalizes upon initialization at the launch point so as to achieve considerable simplification, and hence, low unit cost. An excellent application of such a 'mother-daughter' design is to the guidance of tactical weapons wherein the launch facility (ground launcher or aircraft) is presumed equipped with a full-capability GPS navigation set suitable for the initialization of the simplified receiver. Once initialized with GPS data (satellite orbital parameters and clock corrections) and synchronized to track the received signals, this receiver is thereafter fully capable of autonomous navigation including signal reacquisition following any signal outage periods. Mission time following launch must be limited to no more than an hour or so to minimize degradations in accuracy - a constraint of little concern in most tactical applications. M.M.M.

N80-10175# Gilbert (Glen A.) and Associates, Washington, D. C.
CIVIL APPLICATIONS OF NAVSTAR GPS
Glen A. Gilbert, E. H. Martin (Magnavox Government and Industrial Electronics Co., Silver Spring, Md.), Denis Symes (Urban Mass Transportation Adminstration), and Carl Matthews (Maritime Administration) *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems 1979 26 p refs (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

Various aspects of potential civil applications of the U.S. Department of Defense satellite based NAVSTAR Global Positioning System (GPS) are discussed. Land, sea and air applications are covered. It was concluded that the GPS offers many promising potential civil applications. However, certain questions need to be resolved before international civil application of GPS can be implemented. M.M.M.

N80-10176# Rockwell International Corp., Downey, Calif. Space Div.
LAUNCH VEHICLES
William Nissim and Curt J. Zoller *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems 1979 15 p (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

The launch vehicles and upper stages are described. The physical and performance characteristics and the expected operational procedure, based on data obtained from various Rockwell International publications (for shuttle), and from representatives of General Dynamics (for Atlas) and Fairchild (for the stage vehicle) are included. Potential system improvements for the operational phase which are expected to result in satellite weight growth, can be accommodated by launch and stage vehicle growth options. M.M.M.

N80-10177# California Univ., Los Angeles. School of Engineering and Applied Science.
ALTERNATE CONSTELLATIONS FOR THE GLOBAL POSITIONING SYSTEM
Hosam E. Emara-Shabaik *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems 1979 37 p refs (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

Different satellite constellations were studied comparatively with the base line constellation, considering both coverage and precision requirements. Increasing the orbital period provided better satellite visibility and higher accuracy of navigation. Higher orbital inclination angles moved the better covered areas to higher latitudes. Increasing the number of orbital planes is thought to be more effective in gaining better performance than increasing the number of satellites per plane. General directions and guidelines to be followed for designing constellations for the Global Positioning System are presented. K.L.

N80-10178# California Univ., Los Angeles. School of Engineering and Applied Science.
ON THE OPTIMAL SELECTION OF SATELLITES IN GPS
Katsumi Ohnishi *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems 1979 5 p refs (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

An analytical method is given for the optimal selection of four satellites for estimation of the user's position in global positioning systems (GPS). The problem is discussed completely within the framework of linear estimation theory which converts

the optimal selection of satellites into the optimal orientation of four antennas. An estimator equation is presented which is shown to give good estimation results. The four satellites to be selected are obtained by directly minimizing the determinant of the covariance of the estimation error. K.L.

N80-10179# Naval Air Development Center, Warminster, Pa. Sensors and Avionics Technology Directorate.
THE EVOLUTION OF JTIDS
Ronald S. Vaugh *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems 1979 3 p (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

The genesis of predecessor programs to the Joint Tactical Information Distribution System (JTIDS) is traced and the reasons for merging them into a joint services development program are given. In addition, the major technology evolution affecting the JTIDS engineering approach is discussed. K.L.

N80-10180# JTIDS Program Office, Hanscom AFB, Mass. Engineering Div.
JTIDS SYSTEM OVERVIEW
Roy L. Eisenberg *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems 1979 6 p (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

The navigation, communications, and identification functions of JTIDS are described. The JTIDS development program and implementation concepts are discussed and operational requirements are summarized. K.L.

N80-10181# Naval Air Development Center, Warminster, Pa. Communications and Navigation Technology Directorate.
NAVIGATION ARCHITECTURE
Lawrence Newman, ed. *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems 1979 17 p refs (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

The JTIDS relative navigation capability is discussed. The relative navigation system establishes the tactical grid, resolves the grid lock problem, improves on board system accuracy, and shares community navigation resources. Potential applications of the advanced development model system and technological issues of JTIDS architecture are explored. K.L.

N80-10182# Naval Air Development Center, Warminster, Pa.
INTEGRATED TACTICAL NAVIGATION SYSTEMS (ITNS)
Edward Dinter and James D. Bivin *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems 1979 7 p (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

An integrated tactical navigation systems (ITNS), which combines range measurements between vehicles, with self contained dead reckoning, to achieve accurate tactical navigation in spite of geographic navigation error, is examined. The five demonstration tests performed and their associated results are discussed. The feasibility of the ITNS concept, the operational performance and tactical utility of the ITNS concept, and the benefits of the ITNS to the sea control ships and flight control operations are determined. A.W.H.

N80-10183# ITT Avionics, Nutley, N.J. CNI Systems Dept.
JTIDS: THE ISSUE OF FREQUENCY SELECTION
Jack Rubin and Sven H. Dodington *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems 1979 5 p (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

The joint tactical information distribution system (JTIDS) which features spread spectrum, frequency hopping, high performance, digital communications, is discussed in relation to the electromagnetic spectrum (960 to 1215 MHz) proposed for its operation. The compatibility of the JTIDS with existing navigation services in this frequency band is examined. The interference effects of existing Tacan/DME and IFF/ATCRBS signals on JTIDS operations is studied. A.W.H.

N80-10184# Naval Air Development Center, Warminster, Pa. Communication Navigation Technology Directorate.
JTIDS SIGNAL STRUCTURE
Gerald J. Palatucci *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems 1979 3 p (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

The joint tactical information distribution systems (JTIDS) signal structure is described in terms of a hybrid frequency hopping, time hopping, and direct sequence pseudo noise spread spectrum system for communication, navigation, and identification applications. The primary design constraints, classified as either fundamental bounds or requirements bounds, on the system at the outset of the waveform design are described. The characteristics of the signal structure, such as channel coding, data modulation, and RF modulation are discussed. A.W.H.

N80-10185# Hughes Aircraft Co., Fullerton, Calif.
COMMAND AND CONTROL TERMINALS
Ara N. Boyajian *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems 1979 4 p (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

The systems configuration of the command and control terminals in the joint tactical information distribution system (JTIDS) is discussed. The units that comprise the JTIDS system and the interrelationship between the units are described. The units include the digital computer, the radio set control, the signal data converter, the antenna coupler, and the high power amplifier. Technology improvements in the JTIDS system are discussed including areas of error detection and correction, surface acoustic wave devices, and L band power amplifiers. A.W.H.

N80-10186# Singer-Kearfott, Wayne, N. J.
AN/URQ-28 JTIDS CLASS 2 TACTICAL TERMINAL
R. Aughey and G. Soloway *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems 1979 13 p (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

The performance characteristics of the JTIDS tactical aircraft terminal AN/URQ-28, a low detectability, cryptographically secure, antijam, integrated communication and relative navigation system are described. The time division multiple access processing function and the TACAN processing functions are examined. The navigation processing and capability of the AN/URQ-28 is discussed. The mechanical design and the application of each unit in the AN/URQ-28 is reported. A.W.H.

N80-10187# IBM Federal Systems Div., Owego, N. Y.
JTIDS EXPENDABLE/LOW COST TERMINAL DEVELOPMENT
P. D. Danker, R. J. Giannini, and I. S. Glickstein *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems 1979 13 p (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

Applications for low cost, expendable, JTIDS compatible terminals are discussed. These include weapon and RPV guidance and control, remote sensors and beacons, and range instrumentation. Expendable terminals are examined as extensions for the other JTIDS class terminals where expendability and unmanned operations are required and system communications/control resides with the JTIDS Class 1, 2, or 3 terminal. A.W.H.

N80-10188# Naval Ocean Systems Center, San Diego, Calif.
INTEGRATION DEVELOPMENTS
Albert Wunsch *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems 1979 9 p refs (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

The integration of JTIDS into a platform is described. The nature and scope of the interface required between JTIDS and the system(s) it must service on various platforms is defined. Aspects of system integration with the tactical data system are discussed. A.W.H.

N80-10189# ITT Avionics, Nutley, N.J. CNI Systems Dept.
DISTRIBUTED TDMA: AN APPROACH TO JTIDS PHASE 2
Jack Rubin *In* AGARD Principles and Operational Aspects of

Precision Position Determination Systems 1979 14 p refs (For primary document see N80-10154 01-04)
(Contract N62269-76-C-0105)
Avail: NTIS HC A20/MF A01

The joint tactical information distribution system (JTIDS), a triservice, multichannel, multifunction system is reviewed. A time division multiple access (TDMA) channel (JTIDS 1) is introduced to handle total connectivity information distribution for digital communications and relative navigation. The development of a channel architecture by DTAMA to permit a single terminal to participate concurrently in multiple independent functions or network, which have the flexibility to be structured and organized in a manner to efficiently meet the broad spectrum of tactical information distribution operational requirements, is examined.
A.W.H.

N80-10190# ITT Avionics, Nutley, N.J. CNI Systems Dept.
JTIDS II/DTDMA - COMMAND AND CONTROL TERMINALS
Jack Rubin and Joseph Heinen *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems 1979 7 p (For primary document see N80-10154 01-04)
Avail: NTIS HC A20/MF A01

The development of a command and control terminal employing the JTIDS 2/DTDMA architecture is described. The functions of the power amplifier unit, the receiver/transmitter unit, the signal processor unit, and the terminal processor unit are examined. The grouping of the time scheduling, pseudo-random control, and transmission/reception control are presented.
A.W.H.

N80-10191# ITT Avionics, Nutley, N.J. CNI Systems Dept.
JTIDS II/DTDMA TACTICAL TERMINAL
Joseph Heinen and Jack Rubin *In* AGARD Principles and Operational Aspects of Precision Position Determination Systems 1979 6 p ref (For primary document see N80-10154 01-04)
(Contract N62269-76-C-0105)
Avail: NTIS HC A20/MF A01

The JTIDS 2 tactical terminal which provides antijam, digital data/voice communications, and relative navigation in the DTDMA and TDMA architectures, is examined. The functions and capabilities, the overall design, the integration and installation into airborne platforms, and the projected production configuration of the terminal are described.
A.W.H.

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.
For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

N80-10192 North Carolina State Univ. at Raleigh.
STRUCTURAL STIFFENING AS AN INTERIOR NOISE CONTROL TECHNIQUE FOR LIGHT TWIN-ENGINE AIRCRAFT Ph.D. Thesis
Clyde Kearney Barton 1979 102 p
Avail: Univ. Microfilms Order No. 7923034

Cabin noise levels in light aircraft due to the transmission of low frequency propeller noise through the fuselage sidewall is examined. The concept of adding stiffness to a light, twin engine aircraft to reduce cabin noise levels is investigated. The attenuation provided by the fuselage sidewall before and after the installation of a suitable treatment is determined. A mass treatment was added and a comparison is presented.
Dissert. Abstr.

N80-10193*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXPERIMENTS IN SENSING TRANSIENT ROTATIONAL ACCELERATION CUES ON A FLIGHT SIMULATOR
Russell V. Parrish Oct. 1979 24 p refs
(NASA-TP-1537; L-13030) Avail: NTIS HC A02/MF A01 CSCL 01C

Results are presented for two transient motion sensing experiments which were motivated by the identification of an anomalous roll cue (a 'jerk' attributed to an acceleration spike) in a prior investigation of realistic fighter motion simulation. The experimental results suggest the consideration of several issues for motion washout and challenge current sensory system modeling efforts. Although no sensory modeling effort is made it is argued that such models must incorporate the ability to handle transient inputs of short duration (some of which are less than the accepted latency times for sensing), and must represent separate channels for rotational acceleration and velocity sensing.
A.R.H.

N80-10194# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
FLYING QUALITIES RESEARCH FOR HIGHLY AUGMENTED AIRCRAFT
H. T. Breul and R. C. Weston Aug. 1979 104 p refs
(RE-582) Avail: NTIS HC A06/MF A01

An introductory, single degree of freedom experimental study of aircraft roll control was performed to demonstrate the feasibility of doing flying qualities research via direct manipulation of an aircraft's step response on a flight simulator. This is a very attractive approach for studying the flying qualities requirements of modern aircraft that is expected to incorporate new and sophisticated digital fly by wire control schemes for coordinating all control forces to produce nonclassical responses to pilot commands. The development of a digital simulation technique, based on the mathematical concept of convolution, that provides the means for easy manipulation of the simulated vehicle's step-response characteristics is presented. Two experiments were performed that examined several basic characteristics of an aircraft's roll-rate step-response in a simulated tracking task.
M.M.M.

N80-10195*# Teledyne Ryan Aeronautical Co., San Diego, Calif.
STUDY OF THE FEASIBILITY ASPECTS OF FLIGHT TESTING AN AEROELASTICALLY TAILORED FORWARD SWEPT RESEARCH WING ON A BQM-34F DRONE VEHICLE
D. J. Mourey 3 Sep. 1979 409 p refs
(Contract NAS1-15624)
(NASA-CR-159149) Avail: NTIS HC A18/MF A01 CSCL 01C

The aspects of flight testing an aeroelastically tailored forward swept research wing on a BQM-34F drone vehicle are examined. The geometry of a forward swept wing, which is incorporated into the BQM-34F to maintain satisfactory flight performance, stability, and control is defined. A preliminary design of the aeroelastically tailored forward swept wing is presented.
A.W.H.

N80-10196# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
A STUDY TO DEVELOP OPTIMIZATION ALGORITHMS FOR AIRCRAFT WING STRUCTURES M.S. Thesis
Gerald W. Abbott and Robert A. McNamara, Jr. Jun. 1979 135 p refs
(AD-A072668; AFIT-LSSR-23-79A) Avail: NTIS HC A07/MF A01 CSCL 01/3

Increasing cost and complexity of major weapon systems have resulted in many methods that constrain cost while assuring development of weapon systems that meet the military need. Among these methods, the use of cost estimating relationships embodied in computerized mathematical modeling has come to the forefront. This research uses the Vehicle Design Evaluation Program (VDEP), a model which designs a least-weight aircraft. Since a least-weight aircraft may not be a least-cost aircraft, this research examined the feasibility of developing algorithms to relate least-cost to design using VDEP. Various graphic and statistical techniques failed to yield meaningful relationships. Additional analysis revealed apparent discrepancies in VDEP structural synthesis routines. Further research is recommended using more advanced design/cost models which incorporate revised structural synthesis routines. These models should first be validated for proper design/cost estimating properties. Then research should be conducted to identify cost driving parameters and detailed variable relationships. In this way the attainment of minimum cost aircraft structures which meet mission needs will materialize.
GRA

N80-10197# Anamet Labs., Inc., San Carlos, Calif. Applied Mechanics Div.

ANGULAR VIBRATION OF AIRCRAFT. VOLUME 1: EXECUTIVE SUMMARY Final Report, Aug. 1977 - Apr. 1979

Conor D. Johnson, Warren C. Gibson, David A. Kienholz, and Ernest B. Paxson Wright-Patterson AFB, Ohio AFFDL Apr. 1979 52 p refs 2 Vol.

(Contract F33615-77-C-3050; AF Proj. 2401)

(AD-A071895; AFFDL-TR-79-3045-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 20/11

This report describes development work in several distinct areas, all related to prediction of angular vibration of aircraft structures. Angular vibration in this context refers to dynamic rotations or changes in slope at specific points on a vibrating structure. It is of interest primarily in connection with high resolution optical and electro-optical systems. Efforts were directed at both low frequency vibration, where individual normal modes are known, as well as high frequency vibration where they are not. For low frequency predictions, improved accuracy per unit cost was sought by an evolutionary improvement to an existing finite element code. A state-of-the-art shell element, the Semi-Loof, was incorporated into NASTRAN by means of pre- and post-processors and DMAP instructions. Its accuracy is tested against both closed form solutions for simple cases and experiment for an actual fuselage. For high frequency predictions the method of Statistical Energy Analysis was pursued. A demonstration case involving two coupled plates is presented to show how SEA may be used to predict angular vibration in a situation where normal modes are too numerous to be predicted individually. Relationships between linear and angular vibration were developed for various structural forms. Theoretical error bounds are also derived for spectral measurements of angular vibration which are obtained by differencing of signals from translational sensors. GRA

N80-10198# Anamet Labs., Inc., San Carlos, Calif. Applied Mechanics Div.

ANGULAR VIBRATION OF AIRCRAFT. VOLUME 2: PREDICTION METHODS FOR ANGULAR VIBRATION Final Report, Aug. 1977 - Apr. 1979

Conor D. Johnson, Warren C. Gibson, David A. Kienholz, and Ernest B. Paxson Wright-Patterson AFB, Ohio AFFDL Apr. 1979 459 p refs 2 Vol.

(Contract F33615-77-C-3050; AF Proj. 2401)

(AD-A071749; AFFDL-TR-TA-3045-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 01/3

This report describes development work in several distinct areas, all related to prediction of angular vibration of aircraft structures. Angular vibration in this context refers to dynamic rotations or changes in slope at specific points on a vibrating structure. It is of interest primarily in connection with high resolution optical and electro-optical systems. Efforts were directed at both low frequency vibration, where individual normal modes are known, as well as high frequency vibration where they are not. For low frequency predictions, improved accuracy per unit cost was sought by an evolutionary improvement to an existing finite element code. For high frequency predictions the method of Statistical Energy Analysis was pursued. GRA

N80-10199# Civil and Environmental Engineering Development Office, Tyndall AFB, Fla.

A LITERATURE SEARCH AND REVIEW OF THE DYNAMICS OF AIRCRAFT-SURFACE INTERACTION Final Report, 1 Oct. 1977 - 31 May 1978

Joseph J. Cox, Jr. (USAF Academy, Colo.), William M. Henghold (USAF Academy, Colo.), and John J. Russell (USAF Academy, Colo.) Jun. 1979 61 p refs

(AF Proj. 2104)

(AD-A070940; CEEDO-TR-78-39) Avail: NTIS HC A04/MF A01 CSCL 01/5

This report presents a literature survey and review of the research concerned with the dynamics of aircraft-surface interaction. Of primary concern is the determination of surface roughness criteria based on how rough the surface can be without inducing structural damage in the aircraft. Attention is concentrated on analytical research in the form of computer simulation that deals with the aircraft response as a function of the input (external excitation), vehicle model, and the output. Basic conclusions include the fact that no current computer code is satisfactory, but that one could be formulated within the state-of-the-art, to correlate with on-going actual aircraft tests. To facilitate correlation the roll, yaw, and lateral degrees of freedom should be included and a fatigue analysis for the test aircraft should be made. GRA

N80-10200# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.

LEXICON OF AIRCRAFT TRANSPARENCY TERMS

Cletus J. Muick Dec. 1978 65 p refs

(AF Proj. 7184)

(AD-A071319; AMRL-TR-78-122) Avail: NTIS HC A04/MF A01 CSCL 01/3

This lexicon deals with terms and definitions peculiar to personnel working with aircraft transparent enclosures. All types of material currently used in the fabrication of transparent enclosures (acrylic, glass, polycarbonate) is addressed. Terms are either specific or general when applied to materials; and vision /optics terms, in most instances, are common to windscreens, canopies, and windows. GRA

N80-10201# Air Force Weapons Lab., Kirtland AFB, N. Mex.

AIRBLAST VULNERABILITY ENVELOPES FOR SUPERSONIC AEROSPACE VEHICLES Final Report

Gerald M. Campbell Mar. 1979 30 p

(AF Proj. 8809)

(AD-A072247; AD-E200312; AFWL-TR-78-187) Avail: NTIS HC A09/MF A01 CSCL 19/4

A procedure for constructing airblast vulnerability envelopes for supersonic vehicles has been derived which enables the analyst to determine which portions of the envelope are valid. For simplicity, an overpressure of 1 lb/sq in. is used as a damage criterion throughout this report and nonhomogeneous atmosphere effects are ignored. Maximum and minimum shock front velocities are derived for the catching curve as well as the lower limit for the detonation orientation angle theta. GRA

N80-10202# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

AGARD TWO-DIMENSIONAL AEROELASTIC CONFIGURATIONS

S. R. Bland. Comp. Aug. 1979 16 p refs Submitted for publication Prepared in cooperation with NASA Langley Res. Center

(AGARD-AR-156) Avail: NTIS HC A02/MF A01

The development of reliable, efficient methods for the calculation of unsteady aerodynamic forces in the frequency-critical transonic speed regime can be enhanced by the availability of a limited number of test cases for the comparison of competing methods. Seven test cases are presented for airfoils with thickness from 6.0% to 16.5%: a biconvex parabolic arc airfoil, three conventional airfoils, and three cambered supercritical airfoils. The aerodynamic conditions such as Mach number, mean angle of attack, and oscillation amplitude and frequency are also given. Recommendations are made for uniformity in definition and reporting to enhance desired comparison for the aeroelastician. A.R.H.

N80-10203# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

MANOEUVRE LIMITATIONS OF COMBAT AIRCRAFT

Aug. 1979 33 p refs

(AGARD-AR-155A; ISBN-92-835-1336-3) Avail: NTIS HC A03/MF A01

The choice of aircraft detail arrangement and configuration is closely related to desired flight speed, altitude and maneuverability. The maneuver limitations that are directly related to configuration, flight speed and attitude are reasonably independent of airplane size and engine thrust. These limiting flight characteristics include pitchup, wing rock, wing drop, nose slice, and buffeting. These configuration and detail-sensitive limitations and the aircraft characteristics that cause them are discussed for 15 NATO aircraft. A.R.H.

N80-10044 Allerton Press, Inc., New York, N. Y.

SELECTING THE GEOMETRIC PARAMETERS AND POSI-

TION OF A NOSE FLAP ON THE ROOT PROFILE OF A SWEPT WING USING TUNNEL TEST DATA. PART 2
A. I. Matyah, V. A. Sterlin, V. A. Popov, V. V. Isaev, and G. A. Chersmukhin *In its* Soviet Aeron., vol. 21, no. 4, 1978 p 62-66 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 81-87 (For primary document see N80-10031 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Avenue, New York, N. Y. 10011; $45.00

N80-10053 Allerton Press, Inc., New York, N. Y.
STRUCTURAL ANALYSIS OF VARIABLE-SWEEP WINGS
N. A. Shelomov and N. A. Gorozhankin *In its* Soviet Aeron., v. 21, no. 4, 1978 p 106-113 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 133-141 (For primary document see N80-10031 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Avenue, New York, N. Y. 10011; $45.00

N80-10058 Allerton Press, Inc., New York, N. Y.
APPLICATION OF THE FACTOR INTERPOLATION METHOD IN FLIGHT VEHICLE LANDING GEAR ANALYTIC DESIGN
A. V. Svilin *In its* Soviet Aeron., v. 21, no. 4, 1978 p 129-131 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 155-158 (For primary document see N80-10031 01-01)
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06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N80-10204*# Pratt and Whitney Aircraft Group, East Hartford, Conn.
AERO-ACOUSTIC TESTS OF DUCT-BURNING TURBOFAN EXHAUST NOZZLES
Hilary Kozlowski and Allan B. Packman Jul. 1976 142 p refs
(Contract NAS3-17866)
(NASA-CR-162254; PWA-5296) Avail: NTIS HC A07/MF A01 CSCL 01E

The acoustic and aerodynamic characteristics of several exhaust systems suitable for duct burning turbofan engines are evaluated. Scale models representing unsuppressed coannular exhaust systems are examined statically under varying exhaust conditions. Ejectors with both hardwall and acoustically treated inserts are investigated. A.W.H.

N80-10205*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AEROPROPULSION 1979
1979 464 p Proceedings of conf. held at Cleveland, Ohio, 1-16 May 1979
(NASA-CP-2092; E-079) Avail: NTIS HC A20/MF A01 CSCL 21E

State of the art technology in aeronautical propulsion is assessed. Noise and air pollution control techniques, advances in supersonic propulsion for transport aircraft, and composite materials and structures for reliable engine components are covered along with engine design for improved fuel consumption. For individual titles, see N80-10206 through N80-10219.

N80-10206*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AIRCRAFT ENERGY EFFICIENCY (ACEE) STATUS REPORT
Donald L. Nored, James F. Dugan, Jr., Neal T. Saunders, and Joseph A. Ziemianski *In its* Aeropropulsion 1979 1979 p 1-58 refs (For primary document see N80-10205 01-07)
Avail: NTIS HC A20/MF A01 CSCL 21E

Fuel efficiency in aeronautics, for fuel conservation in general as well as for its effect on commercial aircraft operating economics is considered. Projects of the Aircraft Energy Efficiency Program related to propulsion are emphasized. These include: (1) engine component improvement, directed at performance improvement and engine diagnostics for prolonged service life; (2) energy efficient engine, directed at proving the technology base for the next generation of turbofan engines; and (3) advanced turboprop, directed at advancing the technology of turboprop powered aircraft to a point suitable for commercial airline service. Progress in these technology areas is reported. J.M.S.

N80-10207*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EMISSION REDUCTION
Donald A. Petrash, Larry A. Diehl, Robert E. Jones, and Edward J. Mularz *In its* Aeropropulsion 1979 1979 p 59-84 (For primary document see N80-10205 01-07)
Avail: NTIS HC A20/MF A01 CSCL 21E

Control of the gaseous pollutant emissions of aircraft engines is considered in terms of the emission standards for six classes of aircraft engines. Emphasis is placed on combustor design concepts to significantly reduce emissions levels and lean-burning techniques to lower flame temperature, to reduce the oxides of nitrogen in the gaseous emissions. J.M.S.

N80-10208*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NOISE REDUCTION
Charles E. Feiler, John F. Groeneweg, Francis J. Montegani, John P. Raney (NASA. Langley Research Center), Edward J. Rice, and James R. Stone *In its* Aeropropulsion 1979 1979 p 85-128 refs (For primary document see N80-10205 01-07)
Avail: NTIS HC A20/MF A01 CSCL 21E

The turbofan engine's noise-producing components are discussed in terms of efficient and economical noise reduction techniques that do not penalize the engine performance or weight significantly. Specific topics covered include fan noise, acoustic suppression, jet noise technology, combustor noise, and aircraft noise prediction. J.M.S.

N80-10209*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ALTERNATIVE JET AIRCRAFT FUELS
Jack Grobman *In its* Aeropropulsion 1979 1979 p 129-148 refs (For primary document see N80-10205 01-07)
Avail: NTIS HC A20/MF A01 CSCL 21E

Potential changes in jet aircraft fuel specifications due to shifts in supply and quality of refinery feedstocks are discussed with emphasis on the effects these changes would have on the performance and durability of aircraft engines and fuel systems. Combustion characteristics, fuel thermal stability, and fuel pumpability at low temperature are among the factors considered. Combustor and fuel system technology needs for broad specification fuels are reviewed including prevention of fuel system fouling and fuel system technology for fuels with higher freezing points. J.M.S.

N80-10210*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MATERIALS AND STRUCTURES TECHNOLOGY
Robert A. Signorelli, Thomas K. Glasglow, Gary R. Halford, and

Stanley R. Levine *In its* Aeropropulsion 1979 1979 p 149-186 refs (For primary document see N80-10205 01-07)
Avail: NTIS HC A20/MF A01 CSCL 21E

Materials and structures performance limitations, particularly for the hot section of the engine in which these limitations limit the life of components, are considered. Failure modes for components such as blades, vanes, and combustors and how they are affected by the environment for such components are discussed. Methods used to improve the materials used for such components are: (1) application of directional structures to turbine components for high strength at high temperatures; (2) improved coatings to increase oxidation and corrosion resistance; (3) increase strength and stiffness with reduced weight by applying higher specific properties of composite materials; and (4) cost effective processing such as near net shape powder methods applied to disks. Life prediction techniques developed to predict component life accurately in advance of service and progress in improving the intermediate and cold section components of turbine engines are covered. J.M.S.

N80-10211*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPUTATIONAL FLUID MECHANICS OF INTERNAL FLOW
David N. Bowditch, William D. Mcnally, Bernhard H. Anderson, John J. Adamczyk, and Peter M. Sockol *In its* Aeropropulsion 1979 1979 p 187-230 refs (For primary document see N80-10205 01-07)
Avail: NTIS HC A20/MF A01 CSCL 21E

Major solution techniques for internal computational fluid mechanics are discussed and some examples are presented. The major steps involved in developing a large computer code are then discussed. R.E.S.

N80-10212*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TURBOMACHINERY TECHNOLOGY
Cavour H. Hauser, Jeffrey E. Haas (U.S. Army Res. and Technol. Labs., Cleveland, Ohio), Lonnie Reid, and Francis S. Stepka *In its* Aeropropulsion 1979 1979 p 231-272 (For primary document see N80-10205 01-07)
Avail: NTIS HC A20/MF A01 CSCL 21E

A technology assessment of turbomachinery is presented. The design of the fan, compressor, and turbine components for future advanced aircraft engines is discussed. Basic flow characteristics in compressors and turbines and the heat transfer phenomena in cooled turbines are also discussed. R.E.S.

N80-10213*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MECHANICAL COMPONENTS
William J. Anderson, Robert C. Bill, John J. Coy, and David Fleming *In its* Aeropropulsion 1979 1979 p 273-308 ref (For primary document see N80-10205 01-07)
Avail: NTIS HC A20/MF A01 CSCL 21E

Research on bearings, gears, seals, and rotor dynamics (specifically high speed balancing and dampers) is presented. The research pertains to problems in both aircraft turbine engines and helicopter transmissions. R.E.S.

N80-10214*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INSTRUMENTATION TECHNOLOGY
William C. Nieberding, David R. Englund, Jr., and George E. Glawe *In its* Aeropropulsion 1979 1979 p 309-328 refs (For primary document see N80-10205 01-07)
Avail: NTIS HC A20/MF A01 CSCL 21E

Some of the efforts made in applying technologically new tools to today's propulsion measurement problems are described. They include: (1) a blade-tip clearance system; (2) a pulsed thermocouple system used to measure gas temperature with a thermocouple at temperatures above the melting point of the thermocouple; (3) an optical technique for measuring blade flutter; (4) a probe for dynamic flow and flow angle measurement; and (5) a laser anemometer system for rapidly mapping the flow profiles between the blades of a rotating compressor. R.E.S.

N80-10215*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CONTROL TECHNOLOGY
John R. Szuch *In its* Aeropropulsion 1979 1979 p 329-344 refs (For primary document see N80-10205 01-07)
Avail: NTIS HC A20/MF A01 CSCL 21E

An overview of engine control technology is presented with emphasis on gas turbine engine controls. The role of the government, and NASA in particular, in advancing this technology is discussed. R.E.S.

N80-10216*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SUPERSONIC PROPULSION TECHNOLOGY
Albert G. Powers, Robert E. Coltrin, Leonard E. Stitt, Richard J. Weber, and John B. Whitlow, Jr. *In its* Aeropropulsion 1979 1979 p 345-386 (For primary document see N80-10205 01-07)
Avail: NTIS HC A20/MF A01 CSCL 21E

Propulsion concepts for commercial supersonic transports are discussed. It is concluded that variable cycle engines, together with advanced supersonic inlets and low noise coannular nozzles, provide good operating performance for both supersonic and subsonic flight. In addition, they are reasonably quiet during takeoff and landing and have acceptable exhaust emissions. K.L.

N80-10217*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HYPERSONIC PROPULSION
H. Lee Beach, Jr. *In its* Aeropropulsion 1979 1979 p 387-408 refs (For primary document see N80-10205 01-07)
Avail: NTIS HC A20/MF A01 CSCL 21E

Research on hydrogen fueled scramjet engines for hypersonic flight is reviewed. Component developments, computational methods, and preliminary ground tests of subscale scramjet engine modules at Mach 4 and 7 are emphasized. Airframe integration, structures, and flow diagnostics are also discussed. It is shown that mixed-mode perpendicular and parallel fuel injection controls heat release over a wide Mach range and the fixed geometry inlet gives good performance over a wide range of Mach numbers. K.L.

N80-10218*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
VERTICAL TAKEOFF AND LANDING (VTOL) PROPULSION TECHNOLOGY
Carl C. Ciepluch, John M. Abbott, Royce D. Moore, and James F. Sellers *In its* Aeropropulsion 1979 1979 p 409-444 refs (For primary document see N80-10205 01-07)
Avail: NTIS HC A20/MF A01 CSCL 21E

Propulsion problems and advanced technology requirements of VTOL aircraft are discussed. Specific topics covered include inlets with high angle of attack capability, rapid thrust modulation fans, and propulsion-system/aircraft-control integration. K.L.

N80-10219*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH-PERFORMANCE-VEHICLE TECHNOLOGY
Louis A. Povinelli *In its* Aeropropulsion 1979 1979 p 445-462 refs (For primary document see N80-10205 01-07)
Avail: NTIS HC A20/MF A01 CSCL 21E

Propulsion needs of high performance military aircraft are discussed. Inlet performance, nozzle performance and cooling, and afterburner performance are covered. It is concluded that nonaxisymmetric nozzles provide cleaner external lines and enhanced maneuverability, but the internal flows are more complex. Swirl afterburners show promise for enhanced performance in the high altitude, low Mach number region. K.L.

N80-10220*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.
FLIGHT EFFECTS ON THE AERO/ACOUSTIC CHARACTERISTICS OF INVERTED PROFILE COANNULAR NOZZLES
Hilary Kozlowski and Allan B. Packman Feb. 1978 195 p refs
(Contract NAS3-17866)
(NASA-CR-162419; PWA-5501) Avail: NTIS HC A09/MF A01 CSCL 21E

The effect of simulated flight speed on the acoustic and

aerodynamic characteristics of coannular nozzles is examined. The noise and aerodynamic performance of the coannular nozzle exhaust systems over a large range of operating flight conditions is presented. The jet noise levels of the coannular nozzles are discussed. The impact of fan to primary nozzle area ratio and the presence of an ejector on flight effects are investigated. The impact of flight speed on the individual components of the coannular jet noise was ascertained. A.W.H.

N80-10221*# Pratt and Whitney Aircraft Group, East Hartford, Conn.

EXPERIMENTAL EVALUATION OF A LOW EMISSIONS HIGH PERFORMANCE DUCT BURNER FOR VARIABLE CYCLE ENGINES (VCE) Final Report

R. P. Lohman and R. J. Mador 1979 117 p refs

(Contract NAS3-20602)

(NASA-CR-159694; PWA-5513-32) Avail: NTIS HC A05/MF A01 CSCL 21E

A three-stage Vorbix duct burner was evaluated to determine the performance and emissions characteristics of this concept and to refine the configuration to provide acceptable durability and operational characteristics for its use in the VCE Testbed Program. The tests were conducted at representative takeoff, transonic climb and supersonic cruise inlet conditions for the VSCE-502B study engine. The carbon monoxide and unburned hydrocarbon emissions were low at all three operating conditions with combustion efficiencies in excess of 99.7 percent, as compared to the goal of 99.0 percent. Nitric oxide emissions were moderate but in excess of the program goal of 1 gm/kg at takeoff. The thrust efficiency exceeded the goal level of 94.5 percent reaching a value of 97 percent at supersonic cruise. Soft ignition, the absence of combustion generated acoustic instabilities and liner temperature levels acceptable for experimental hardware were also demonstrated. The total pressure loss across the duct burner, at 6.76 the loss mechanisms have been indentified and, in one configuration 40 percent of this excess loss was eliminated without comprising the emissions or thrust efficiency. A.R.H.

N80-10222*# Pratt and Whitney Aircraft, East Hartford, Conn. Chemical Products Div.

VSCE TECHNOLOGY DEFINITION STUDY Final Report

R. A. Howlett and R. B. Hunt Aug. 1979 114 p refs

(Contract NAS3-21389)

(NASA-CR-159730; PWA-5630-11) Avail: NTIS HC A06/MF A01 CSCL 21E

Refined design definition of the variable stream control engine (VSCE) concept for advanced supersonic transports is presented. Operating and performance features of the VSCE are discussed, including the engine components, thrust specific fuel consumption, weight, noise, and emission system. A preliminary engine design is presented. A.W.H.

N80-10223# Southwest Research Inst., San Antonio, Tex.

MECHANISM OF TURBINE ENGINE LUBRICANT DEPOSITION Final Report, 31 Mar. 1978 - 2 Feb. 1979

J. P. Cuellar, Jr. May 1979 64 p refs

(Contract F33615-76-C-2020; AF PROJ. 3048)

(AD-A072557; SwRi-RS-662; AFAPL-TR-79-2037) Avail: NTIS HC A04/MF A01 CSCL 11/8

An investigation of the degradation and deposition mechanisms for inhibited polyol ester and diester lubricant basestocks is described. Basestocks trimethylolpropane triheptanoate and di(2-ethylhexyl) adipate containing antioxidants p, p,p' dioctyldiphenylamine and/or phenyl-alpha-naphtylamine were studied in a dynamic thin-film condition with a moist-air atmosphere. Experiments were conducted with a device known as the rotating cylinder rig for the formation of controlled-thickness thin films (0.004 in.) at temperatures in the range of 350 to 550 F. Analytical techniques for detection of lubricant or additive consumption and degradation products included gas liquid chromatography, principally, and gas chromatography/mass spectroscopy. Experiments showed that the antioxidants effectively retarded oxidation and deposition for both ester basestocks up to the time of complete additive consumption. A beneficial synergistic effect on deposition was noted at one concentration using the antioxidants in combination. Findings strongly suggest that an interaction between the ester oxidation products and system wearmetals is a significant factor in the deposition mechanism for both ester types. GRA

N80-10003 Allerton Press, Inc., New York, N. Y.

PARAMETRIC METHOD OF AIRCRAFT ENGINE STATUS DIAGNOSTICS BASED ON LIMITED INFORMATION

A. M. Akhmedzyanov, A. P. Tunakov, Kh. S. Gumerov, Yu. D. Degtyarev, and E. I. Morkovnikova *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 6-11 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 12-18 (For primary document see N80-10001 01-01)

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N80-10006 Allerton Press, Inc., New York, N. Y.

INFLUENCE OF GAS TURBINE ENGINE COMBUSTION CHAMBERS GEOMETRIC PARAMETERS ON MIXTURE FORMATION CHARACTERISTICS

P. P. Grigorenko, Yu. A. Spiridonov, and A. V. Talantov *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 20-24 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats Tekh. (USSR), v. 21, no. 3, 1978 p 30-37 (For primary document see N80-10001 01-01)

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N80-10011 Allerton Press, Inc., New York, N. Y.

DETERMINATION OF TURNING ANGLE OF A JET IMPINGING ON A BUCKET WITH VISOR

L. M. Kotlyar, S. G. Margulis, and E. D. Nesterov *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 40-43 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 58-62 (For primary document see N80-10001 01-01)

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N80-10014 Allerton Press, Inc., New York, N. Y.

ON THE INFLUENCE OF RELATIVE PITCH IN THE SUBSONIC TURBINE CASCADE

V. G. Nesterenko and G. L. Podvidz *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 53-56 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 75-80 (For primary document see N80-10001 01-01)

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N80-10022 Allerton Press, Inc., New York, N. Y.

STUDY OF HEAT-PIPE HEAT EXCHANGER IN THE SMALL GAS TURBINE ENGINE SYSTEM

V. K. Shchukin, I. I. Mosin, N. V. Lokai, and Yu. V. Matveev *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 93-96 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 127-132 (For primary document see N80-10001 01-01)

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N80-10024 Allerton Press, Inc., New York, N. Y.

ANALYTIC REPRESENTATION OF TURBINE CHARACTERISTICS IN FORM CONVENIENT FOR COMPUTER CALCULATION OF GTE PARAMETERS

V. I. Bakulev, K. A. Malinovskii, and V. S. Yakushev *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 104-110 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 142-144 (For primary document see N80-10001 01-01)

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LONG-LIFT GTE OPERATION BASED ON TECHNICAL CONDITION

A. A. Mukhin, A. A. Kovalev, and A. A. Kornoukhov *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 116-118 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 153-156 (For primary document see N80-10001 01-01)

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N80-10028 Allerton Press, Inc., New York, N. Y.
USE OF THE METHOD OF VARIABLE DIRECTIONS FOR NUMERICAL STUDY OF THE TEMPERATURE STATES OF A TURBINE DISK WITH BLADES
A. M. Polyakov, V. S. Petrovskii, and V. I. Krichakin *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 119-122 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 156-160 (For primary document see N80-10001 01-01)
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N80-10029 Allerton Press, Inc., New York, N. Y.
CHARACTERISTICS OF AFTERBURNING BYPASS TURBOJET ENGINE WITH OXYGEN INJECTION INTO THE AFTERBURNER CHAMBER
B. D. Fishbein *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 123-126 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 160-164 (For primary document see N80-10001 01-01)
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N80-10042 Allerton Press, Inc., New York, N. Y.
BASIC PROBLEM OF AIRCRAFT GAS TURBINE ENGINE ANALYTIC DESIGN, PART 1
Yu. V. Kozhevnikov, V. O. Borovik, V. S. Ivanov, V. A. Talyzin, Agliullin, and Ya. V. Melusov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 53-57 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 68-74 (For primary document see N80-10031 01-01)
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N80-10063 Allerton Press, Inc., New York, N. Y.
GAS CURTAINS IN GAS TURBINE ENGINES
I. S. Varganov *In its* Soviet Aeron., v. 22, no. 1 1979 p 6-10 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 11-16 (For primary document see N80-10061 01-01)
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STUDY OF HOMOGENEOUS COMBUSTION CHAMBER TEMPERATURE FIELD NONUNIFORMITY WITH PRIMARY ZONE PARAMETER VARIATION
O. A. Evin, V. M. Yankovskii, and I. N. Pyatilov *In its* Soviet Aeron., v. 22, no. 1 1979 p 16-19 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 24-29 (For primary document see N80-10061 01-01)
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N80-10067 Allerton Press, Inc., New York, N. Y.
COMPUTER CALCULATION OF STATIONARY TEMPERATURE FIELDS IN AIR-COOLED TURBINE ROTOR BLADES
V. I. Lokai, Yu. N. Ivanshin, and Sh. Sh. Abdrakhmanov *In its* Soviet Aeron., v. 22, no. 1 1979 p 26-29 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 36-40 (For primary document see N80-10061 01-01)
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N80-10068 Allerton Press, Inc., New York, N. Y.
SELECTION OF OPTIMAL PARAMETERS OF HEAT-PIPE HEAT EXCHANGER FOR A GAS TURBINE ENGINE
N. V. Lokai and I. I. Mosin *In its* Soviet Aeron., v. 22, no. 1 1979 p 30-34 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 41-46 (For primary document see N80-10061 01-01)
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N80-10069 Allerton Press, Inc., New York, N. Y.
COMPUTER CALCULATION OF STATIONARY TEMPERATURE FIELDS IN COOLED TURBINE DISCS
V. I. Lokai, V. V. Zhulkov, and R. D. Fakhrutdinov *In its* Soviet Aeron., v. 22, no. 1 1979 p 35-38 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 47-50 (For primary document see N80-10061 01-01)
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N80-10071 Allerton Press, Inc., New York, N. Y.
SYSTEMATIZATION OF SIMPLE DETAIL PARTS OF REGULABLE NOZZLE OF GAS TURBINE ENGINE
I. E. Sapozhkov and E. D. Stenkin *In its* Soviet Aeron., v. 22, no. 1 1979 p 44-49 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 57-63 (For primary document see N80-10061 01-01)
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N80-10075 Allerton Press, Inc., New York, N. Y.
STUDY OF MASS EXCHANGE BETWEEN PRIMARY ZONE AND SECONDARY AIR JETS IN GAS TURBINE ENGINE COMBUSTION CHAMBERS
V. G. Shumachenko, V. M. Yankovskii, and A. V. Stalantov *In its* Soviet Aeron., v. 22, no. 1 1979 p 64-67 ref Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 81-85 (For primary document see N80-10061 01-01)
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CENTRIPETAL TURBINE FABRICATION TECHNOLOGY
L. P. Goldun and A. A. Polyakov *In its* Soviet Aeron., v. 22, no. 1 1979 p 74-75 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats Tekhn. (USSR), v. 22, no. 1, 1979 p 91-93 (For primary document see N80-10061 01-01)
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N80-10083 Allerton Press, Inc., New York, N. Y.
ON THE INFLUENCE OF SHORT SHROUD PLATFORMS ON TURBINE STAGE OPERATION
R. V. Kuzmichev and G. V. Proskuryakov *In its* Soviet Aeron., v. 22, no. 1 1979 p 90-92 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 105-107 (For primary document see N80-10061 01-01)
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N80-10086 Allerton Press, Inc., New York, N. Y.
ON AXIAL TURBINE STAGE ROTOR BLADE TWIST WITH TANGENTIAL TILT OF THE STATOR VANES
Yu. I. Mityushkin, A. V. Perevoznikov, and V. P. Yakovlev *In its* Soviet Aeron., v. 22, no. 1 1979 p 99-101 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 112-115 (For primary document see N80-10061 01-01)
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N80-10089 Allerton Press, Inc., New York, N. Y.
NONSTATIONARITY OF HEAT TRANSFER IN AXIAL TURBINE BLADING DURING ENGINE STARTUP
A. M. Polyakov, V. S. Petrovskii, and V. I. Krichakin *In its* Soviet Aeron., v. 22, no. 1 1979 p 108-111 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 119-123 (For primary document see N80-10061 01-01)
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N80-10090 Allerton Press, Inc., New York, N. Y.
LASER DOPPLER VELOCIMETER (LDV) STUDY OF SECONDARY FLOWS IN TURBINE CASCADE
A. M. Topunov, B. Tikhomirov, and L. L. Chernyshev *In its*

Soviet Aeron., v. 22, no. 1 1979 p 112-114 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 123-126 (For primary document see N80-10061 01-01)
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N80-10091 Allerton Press, Inc., New York, N. Y.
PNEUMATIC DISTRIBUTOR FOR TURBOJET ENGINE CONTROL SYSTEM
M. G. Khabibullin *In its* Soviet Aeron., v. 22, no. 1 1979 p 115-116 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 126-127 (For primary document see N80-10061 01-01)
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08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N80-10224*# Delco Electronics, Santa Barbara, Calif.
ELECTROMECHANICAL FLIGHT CONTROL ACTUATOR Final Report
Feb. 1979 129 p
(Contract NAS9-14952)
(NASA-CR-160348; R79-2) Avail: NTIS HC A07/MF A01 CSCL 01C

The feasibility of using an electromechanical actuator (EMA) as the primary flight control equipment in aerospace flight is examined. The EMA motor design is presented utilizing improved permanent magnet materials. The necessary equipment to complete a single channel EMA using the single channel power electronics breadboard is reported. The design and development of an improved rotor position sensor/tachometer is investigated. A.W.H.

N80-10225*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COMPARISON OF STABILITY AND CONTROL PARAMETERS FOR A LIGHT, SINGLE-ENGINE, HIGH-WINGED AIRCRAFT USING DIFFERENT FLIGHT TEST AND PARAMETER ESTIMATION TECHNIQUES
William T. Suit and Robert L. Cannaday Sep. 1979 54 p refs
(NASA-TM-80163) Avail: NTIS HC A04/MF A01 CSCL 01C

The longitudinal and lateral stability and control parameters for a high wing, general aviation, airplane are examined. Estimations using flight data obtained at various flight conditions within the normal range of the aircraft are presented. The estimations techniques, an output error technique (maximum likelihood) and an equation error technique (linear regression), are presented. The longitudinal static parameters are estimated from climbing, descending, and quasi steady state flight data. The lateral excitations involve a combination of rudder and ailerons. The sensitivity of the aircraft modes of motion to variations in the parameter estimates are discussed. A.W.H.

N80-10226# Salford Univ. (England). Dept. of Aeronautical and Mechanical Engineering.
MULTIVARIABLE DIGITAL CONTROL SYSTEMS Final Report, 1 Jun. 1976 - 31 May 1979
B. Porter Jun. 1979 180 p refs
(Grant AF-AFOSR-3005-76)
(AD-A071662; USAME/DC/101/79) Avail: NTIS HC A09/MF A01 CSCL 09/2

The fundamental system-theoretic research and the parallel development of design techniques which have led to the production of the comprehensive software package EIGENFORTRAC are outlined. The capability of EIGENFORTRAC in relation to the computer-aided design of high-performance digital control systems whose functions are simultaneously to reject the unmeasurable disturbances and to track multiple command inputs is described. Numerous references are provided to the system-theoretic research and to the computer algorithms embodied in EIGENFORTRAC. GRA

N80-10227# California Univ., Los Angeles. School of Engineering and Applied Science.
METHOD OF CONJUGATE GRADIENTS FOR OPTIMAL CONTROL PROBLEMS WITH STATE VARIABLE CONSTRAINTS Final Report, May 1977 - May 1978
T. S. Fong and C. T. Leondes Jul. 1978 94 p refs
(Contracts F33615-77-C-3013; AF Proj. 3207)
(AD-A072258; AFFDL-TR-78-85) Avail: NTIS HC A05/MF A01 CSCL 12/1

A review of the computational method of conjugate gradients for linear and nonlinear operator equations is given with emphasis in applying this technique to state variable constraint control problems. The first and second Frechet derivatives of the performance functional are derived. The search directions generated in the iteration process for the optimal control are locally conjugate with respect to the second Frechet derivative. The convergence is along the expanding sequence of sets, the intersection of the linear spaces spanned by the search directions and the set of admissible controls. The computational technique is applied to two state variable constraint problems, in one of which a penalty function is employed to convert the constraint problem to an unconstrained one in addition to the approach considering the constraints directly. For this same problem the method of steepest descent also is studied, and comparison of the results obtained is made and discussed. GRA

N80-10228# Kaman Aerospace Corp., Bloomfield, Conn.
DESIGN CRITERIA FOR DRY LUBRICATED FLIGHT CONTROL BEARINGS Final Report, 22 Jun. 1978 - Mar. 1978
Edward J. Nagy May 1979 180 p
(Contract DAAJ02-76-C-0035; DA Proj. 1F2-62209-AH-76)
(AD-A071322; R-1456; USARTL-TR-79-17) Avail: NTIS HC A09/MF A01 CSCL 01/3

The objective of this program was to develop analytical methods for the selection of dry lubricated helicopter control bearings for specific conditions of use. The conditions of use include static radial pressure, cyclic radial pressure, speed of ball oscillation, angle of ball oscillation, static axial load, contamination, and combinations of these variables. Performance was measured by radial clearance which was directly related to wear. Sixty-one bearings were tested in three wear test rigs. The wear test results were used to develop wear life equations. Three approaches to equation development were utilized in this report: empirical, deterministic, and theoretical. GRA

N80-10229# California Univ., Los Angeles. School of Engineering and Applied Science.
MAXIMUM LIKELIHOOD IDENTIFICATION OF LINEAR DISCRETE STOCHASTIC SYSTEMS Final Report, May 1977 - May 1978
A. J. Glassman and C. T. Leondes Wright-Patterson AFB, Ohio AFFDL Jul. 1978 205 p refs
(Contract F33615-77-C-3013; AF Proj. 2307)
(AD-A072147; AFFDL-TR-78-84) Avail: NTIS HC A10/MF A01 CSCL 12/2

The method of maximum likelihood is applied to the identification of parameters in systems described by linear difference equations. The equations are assumed to be completely known except for the state variable coefficients, i.e., the state transition matrix, and, in certain situations, the initial conditions. The estimates are based on known normal operating input and on output measurements corrupted by additive Gaussian noise. Maximum likelihood estimators of the parameters are developed for the following four cases: initial condition known, initial condition unknown parameter, initial condition unknown random variable, and an equivalent equation-error model configuration. Finite sample and asymptotic properties of the estimators as well as computational aspects are investigated. The study is oriented toward real time applications. Application of maximum likelihood to the above four cases differs from the classical situation in statistics because the measurements are not identically

distributed, or are not independent, or both. The resulting estimates are roots or cumbersome nonlinear equations. GRA

N80-10032 Allerton Press, Inc., New York, N. Y.
THE INVERSE PROBLEM OF CONTROL SYSTEM GUARANTEED SENSITIVITY
Yu. V. Aleksandrov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 1-5 refs Transl. into ENGLISH of Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4 1978 p 5-10 (For primary document see N80-10031 01-01)
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N80-10035# Allerton Press, Inc., New York, N. Y.
ANALYTIC DESIGN OF REGULATORS FOR CONTROLLING ELASTIC FLIGHT VEHICLE ROTATION ABOUT THE LONGITUDINAL AXIS
A. A. Baloev *In its* Soviet Aeron., v. 21, no. 4, 1978 p 16-21 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4 1978 p 23-28 (For primary document see N80-10031 01-01)
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N80-10037 Allerton Press, Inc., New York, N. Y.
OPTIMAL CONTROL OF FLIGHT VEHICLE WITH ELASTIC ELEMENTS
V. V. Vasilin, G. L. Degtyarev, and N. K. Yunusov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 27-31 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 36-42 (For primary document see N80-10031 01-01)
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N80-10046 Allerton Press, Inc., New York, N. Y.
ON MODELING SENSITIVITY OF A LINEAR SYSTEM TO REDUCTION OF ITS ORDER BY THE INFINITESIMAL TRANSFORMATION METHOD IN THE YAW MOTION CONTROL PROBLEM
V. G. Pavlov *In its* Soviet Aeron., v. 21, no. 4 1978 p 72-75 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats Tekh., (USSR), v. 21, no. 4, 1978 p 94-98 (For primary document see N80-10031 01-01)
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N80-10047 Allerton Press, Inc., New York, N. Y.
ON THE EMPENNAGE SNAP-THROUGH PROBLEM
V. A. Pavlov and S. K. Chernikov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 76-80 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved Aviats Tekh., (USSR), v. 21, no. 4, 1978 p 99-104 (For primary document see N80-10031 01-01)
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09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N80-10230# Illinois Univ., Urbana. Dept. of Civil Engineering.
LONGITUDINAL JOINT SYSTEMS IN SLIP-FORMED RIGID PAVEMENTS. VOLUME 1: LITERATURE SURVEY AND FIELD INSPECTION Interim Report
Ernest J. Barenberg and Roger E. Smith Jan. 1979 143 p refs
(Contract DOT-FH-11-8474)
(AD-A066320; FAA-RD-79-4-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 01/5

The cost effectiveness of various load transfer systems across longitudinal joints in slip formed concrete pavements are determined. A literature survey and field inspections of existing pavements with keyed load transfer systems and of construction of pavements with slip form pavers are discussed. Alternate joint systems developed are described. A.W.H.

N80-10231*# Southampton Univ. (England).
CRYOGENIC WIND TUNNEL ACTIVITIES AT THE UNIVERSITY OF SOUTHAMPTON
M. J. Goodyear Hampton, Va. NASA Sep. 1979 10 p refs (Grant NsG-7523)
(NASA-CR-159144) Avail: NTIS HC A02/MF A01 CSCL 14B

The characteristics and behavior of a 0.3m transonic cryogenic wind tunnel are discussed. The wide band of usable Reynolds numbers is analyzed along with a flow visualization technique using propane. The combination of magnetic suspension with the cryogenic wind tunnel is described. An outline of the circuit showing the locations of the magnet system and the features of the tunnel are presented. A.W.H.

N80-10232# Royal Aircraft Establishment, Farnborough (England).
DEVELOPMENT OF AN AIR HEATER FOR A MIXTURE FORMATION TEST RIG
H. D. Dietelrath May 1979 24 p refs Transl. into ENGLISH of report IB-351-77/36 (West Germany), DVL, Aachen, Dec. 1977 24 p
(RAE-Trans-2012; BR70095) Avail: NTIS HC A02/MF A01

The design and development of a 400 kW air heater for a mixture formation test rig is described. Temperature requirements, the metal chosen for the heat conductor, the heating coils, and the thermal insulation are assessed. Electrical heaters used to heat air for hypersonic wind tunnels are discussed. A.W.H.

N80-10233# Air Force Human Resources Lab., Brooks AFB, Tex.
ADVANCED SIMULATOR FOR PILOT TRAINING (ASPT): G-SEAT OPTIMIZATION Interim Report, May 1977 - Apr. 1978
Dan C. McGuire (Williams AFB, Ariz.) and David R. Lee (Williams AFB, Ariz.) Feb. 1979 35 p refs
(AF Proj. 1123)
(AD-A068475; AFHRL-TR-78-92) Avail: NTIS HC A03/MF A01 CSCL 05/9

This report documents Phase I (of III) of a project to optimize the effectiveness of the ASPT g-seat in terms of both hardware and software performance. The transport lag was reduced to 20 ms by moving the Conoflow valves to the platform and using higher diameter hoses. The time constant was reduced to 150 ms by using larger diameter hoses, changing the needle valve location, and optimizing the settings of the booster and needle valve adjustments. The software has been reorganized, improved, streamlined and documented so that it may be more readily used to determine the most effective drive techniques. The optimized system will be used in a Phase II to determine the most effective drive technique and in a Phase III which will emulate new g-cueing devices, geometries, and drive schemes. GRA

N80-10234# Air Force Avionics Lab., Wright-Patterson AFB, Ohio. System Avionics Div.
VIDEO CONTROL CENTER AND COCKPIT SIMULATOR Final Report, 1 Oct. 1976 - 30 Sep. 1978
Derryl A. Williams Apr. 1979 23 p
(AF Proj. 2003)
(AD-A071313; AFAL-TR-79-1081) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report is intended to be for general information on the cockpit simulator design. The report gives the basic concepts for the use of the system but does not give all circuitry details. The system is designed for flexibility. A user is presented with 24 pin connectors for switches and lamps. His task is to physically configure his keyboards, readouts, etc., and meet the signal requirements of the system; specifically, that switches supply -5 volts and that lamps select the appropriate supply voltage

from the connector. For analog inputs a set of analog to digital converters will be interfaced to the PDP-11 and appropriate input ports made available. The user's only restriction is the signal compatibility. The characteristics of the system are then controlled by software. By having the hardware in the console the cockpit per se could be replaced or even a second cockpit or crew station added by simply plugging in. It is assumed that the design is flexible enough for most requirements. The system allows for easy expansion or modifications. The purpose of the system is a simulation tool which changes with needs and does not become obsolete. GRA

N80-10235# Systems Technology, Inc., Hawthorne, Calif.
MANNED ENGINEERING FLIGHT SIMULATION VALIDATION, PART 1. SIMULATION REQUIREMENTS AND SIMULATOR MOTION SYSTEM PERFORMANCE Final Report, Aug. 1977 - Nov. 1978
L. G. Hoffman and Susan A. Riedel Feb. 1979 209 p
(Contract F33615-77-C-2065)
(AD-A071394; AFFDL-TR-78-192-Pt-1; STI-TR-1110-1) Avail: NTIS CSCL 14/2

The goal of this research is to establish an orderly, relatively simple method for optimizing the presentation of motion cues in moving base simulations. This is accomplished via choice of the drive logic parameters for a given simulator and flying task. The method developed here is based upon use of motion fidelity criteria. It has been applied to optimize the LAMARS motion base drive logic parameters for an air-to-ground scenario. The methods and procedures of this report can be applied for any given motion base and any desired scenario. Criteria for discerning fidelity of motion reproduction are developed. These criteria are composed of various mean-square error measures which reflect differences between simulated and actual in-flight motion. The criteria can be used to answer three questions which arise for every motion base simulation program: is moving base simulation appropriate for the flying tasks to be investigated, how can motion base drive logic parameters be optimized for the flying tasks to be investigated, and will this set of motion drive logic parameters result in motion within simulator capabilities for the flying tasks to be investigated. GRA

N80-10236# Army Research Inst. for the Behavioral and Social Sciences, Arlington, Va.
TRAINING EFFECTIVENESS OF THE CH-47 FLIGHT SIMULATORS
Garvin L. Holman May 1979 91 p refs
(DA Proj. 2Q2-63743-A-772)
(AD-A072317; ARI-RR-1209) Avail: NTIS HC A05/MF A01 CSCL 05/9

The training effectiveness of the CH-47 helicopter flight simulator was evaluated in two parts: Part I used a classical two-group transfer-of-training design using aviators undergoing transition training to the CH-47 helicopter, and Part II assessed the training benefits of periodic training of operational CH-47 aviators in the CH-47 flight simulator using a pretest-train-post test design. Cumulative transfer effectiveness ratios and learning curves are presented for 24 maneuvers taught in the simulator and the aircraft. It was concluded that the CH-47 flight simulator is an effective training device for all maneuvers tested except for those, such as hovering maneuvers, that require extensive visual group referencing at very low altitudes. The simulator was also found to be inadequate for training night operations and terrain flights. GRA

N80-10237# Air Force Human Resources Lab., Brooks AFB, Tex.
SIMULATOR FOR AIR-TO-AIR COMBAT MOTION SYSTEM INVESTIGATION Final Report
John A. Seevers (Calif. State Polytech. Univ., Pomona) and Robert L. Makinney (Williams AFB, Ariz.) Jul. 1979 19 p refs
(AF Proj. 1123)
(AD-A072612; AFHRL-TR-79-18) Avail: NTIS HC A02/MF A01 CSCL 05/9

This investigation was conducted to evaluate the Simulator for Air-to-Air Combat (SAAC) motion system response to known input signals, to observe platform movements, to measure leg extension velocities and accelerations, and to establish delay lags through the system electronics and hydraulics. Signal voltages at pre-established levels were input by a signal generator at the analog-to-digital converter simulating pilot's control stick movements. Resulting platform movement was recorded on strip chart recorder measuring accelerations and final positioning from six linear and angular accelerometers mounted beneath the motion platform. Several noticeable factors were revealed that contribute to the status of the motion platform being less than representative of motion of the aircraft. First, the motion platform lags the input command by a noticeable amount. The platform's motion is about a multiple set of axes rather than a single axis as the command would direct. Also, because of physical constraints on the size of the system, the magnitude and deviation of the motion are limited. A fourth major problem is that when the excursion is near the maximum allowable, the motion is stopped too abruptly, and this stopping is readily perceived by the pilot (the washout problem). GRA

N80-10238# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
DYNAMIC CHARACTERISTICS OF FLIGHT SIMULATOR MOTION SYSTEMS
Sep. 1979 40 p refs
(AGARD-AR-144; ISBN-92-835-1338-X) Avail: NTIS HC A03/MF A01

A uniform method of measuring and reporting motion performance characteristics is presented. Such a uniform method, in addition to aiding system comparison, can assist in system diagnosis and might be used in writing performance specifications. The definitive characteristics selected for system description are excursion limits, describing function, linearity and acceleration noise, hysteresis, and dynamic threshold, definitions and methods of measurement and display are given, illustrated by measurements on particular motion systems. R.E.S.

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see 91 Lunar and Planetary Exploration.

N80-10239*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PIONEER SATURN ENCOUNTER
Sep. 1979 29 p Original contains color illustrations
(NASA-TM-80807) Avail: NTIS HC A03/MF A01 CSCL 22A

The Pioneer Saturn Spacecraft, which began its journey as Pioneer 11, provided the first close view of the rings of Saturn as well as its system of moons. Its payload of 11 operating instruments obtained or confirmed data about the mass, temperature, composition, radiation belts, and atmosphere of the planet and its larger satellite, Titan. It made photometric and polarization measurements of Iapetus, Rhea, Dione, and Tethys, as well as discovered additional rings. Scientific highlights of the mission are summarized. Color imagery provided by the photopolarimeter is included along with illustrations of the planet's magnetic field and radiation belts. A.R.H.

N80-10240*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE DEEP SPACE NETWORK Progress Report, Jul. - Aug. 1979
15 Oct. 1979 185 p refs
(Contract NAS7-100)
(NASA-CR-162414; DSN-PR-42-53) Avail: NTIS HC A09/MF A01 CSCL 14B

Progress is reported in flight project support, tracking and data acquisition research and technology, network engineering, hardware and software implementation, and operations. The functions and facilities of the Deep Space Network are emphasized. For individual titles, see N80-10241 through N80-10264.

N80-10241*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
NETWORK FUNCTIONS AND FACILITIES c14
N. A. Renzetti *In its* The Deep Space Network 15 Oct. 1979 p 1-3 (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 14B

The objectives, functions, and organization of the Deep

Space Network are summarized. Deep space station, ground communication, and network operations control capabilities are described. J.M.S.

N80-10242*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
VOYAGER SUPPORT **c14**
J. E. Allen and H. E. Nance *In its* The Deep Space Network 15 Oct. 1979 p 4-9 ref (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 14B

Tracking and data acquisition for the Voyager project is reported. The post-encounter period for Voyager 1 and the encounter period for Voyager 2, from April 1979 through July 1979, are included. J.M.S.

N80-10243*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PIONEER 11 SATURN ENCOUNTER SUPPORT **c14**
G. M. Rockwell *In its* The Deep Space Network 15 Oct. 1979 p 10-20 ref (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 14B

The preparation of the Deep Space Network (DSN) for support of Pioneer 11 Saturn encounter operations is discussed. The encounter's main objectives, DSN testing, special DSN configurations and procedures, radio science activities, and any other mission-related activities are included. J.M.S.

N80-10244*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
RADIO ASTRONOMY **c89**
R. J. Fahnestock and R. M. Taylor *In its* The Deep Space Network 15 Oct. 1979 p 21-23 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 03A

The Deep Space Network 26 and 64 meter antenna stations operations in support of radio astronomy experiments is discussed. Experiments to study the effects of solar corona on radio signals and to observe radio emissions from X-ray sources are included. J.M.S.

N80-10245*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A VOLTAGE-CONTROLLED OPTICAL RADIO FREQUENCY-PHASE SHIFTER **c74**
K. Y. Lau *In its* The Deep Space Network 15 Oct. 1979 p 24-32 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 20F

The problem of stabilizing an optical-fiber link, in which an RF-modulated optical wave is used for frequency standard transmission, is investigated. Higher reliability is expected if RF phase-shifting, phase error detection, etc., can be done directly on the modulated optical signal. A variable optical phase shifter for the above purpose is proposed, and its properties are illustrated. J.M.S.

N80-10246*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A POINT DESIGN FOR A GYROTRON TRAVELING WAVE TUBE AMPLIFIER **c33**
A. Kupiszewski *In its* The Deep Space Network 15 Oct. 1979 p 33-39 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 09A

A point design for a gyro-TWT amplifier is presented. Steps for deriving the growth rate are explained and design results presented. Parameters for some support equipment are given and consequences of potential design parameter changes are examined. J.M.S.

N80-10247*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DEMONSTRATION OF REMOTE CLOCK MONITORING BY VLBI, WITH THREE BASELINE CLOSURE **c14**
C. M. Cheetham, W. J. Hurd, J. W. Layland, G. A. Madrid, and T. P. Yunck *In its* The Deep Space Network 15 Oct. 1979 p 40-53 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 14B

The capability of very long baseline interferometry (VLBI) to monitor the stability of remotely-located hydrogen maser frequency standards was demonstrated by a series of experiments between Deep Space Stations in Australia, Spain, and California. The measured stabilities of the clock systems, over approximately 10-day intervals, were 1 to 3 parts in 10 to the 13th power, with the instabilities due to the oscillators, the clock distribution systems, the receiving system delays, and the VLBI measurement error. Experiments were conducted independently using two different systems (BLOCKS 0 and WBDAS). Later comparison shows agreement in the order of 1 part in 10 to the 13th power. Closure was demonstrated on three separate occasions to 33, 10, and 13 ns with an error uncertainty of + or - 42 ns. The resolution and consistency of VLBI measurements were demonstrated. M.M.M.

N80-10248*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PROJECTED STATE-OF-THE-ART FOR FREQUENCY STANDARDS FOR THE DSN IN THE 1982 - 1990 TIME FRAME **c32**
W. Higa and R. Sydnor *In its* The Deep Space Network 15 Oct. 1979 p 54-61 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 17B

A study was made of frequency standards that are potentially useful to the DSN in the 1980s. A combination of several devices that have inherently good performance over different averaging time regimes is recommended. This combination consists of a quartz oscillator for short-term, either a quartz oscillator or active hydrogen maser for medium-term, and a passive hydrogen maser or cesium standard for long-term stability. M.M.M.

N80-10249*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE R SUB 0 PARAMETER FOR OPTICAL COMMUNICATION USING PHOTON COUNTING **c74**
R. J. McEliece *In its* The Deep Space Network 15 Oct. 1979 p 62-65 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 20F

It was shown that even under ideal conditions (no thermal noise or dark current, continuously-variable intensity lasers, perfectly accurate photon counters), R sub zero is, at most, one nat per photon in optical systems which use photon counting techniques. A definition is given of R sub zero which applies to any memoryless time-discrete channel whose output alphabet is finite or countable along with a simple upper bound on R sub zero which applies to any such channel. This bound was applied to the specific channel model appropriate for noiseless optical communication to show that R sub zero is less or equal to 1 nat per photon. M.M.M.

N80-10250*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DENSITY AND RELIABILITY PREDICTIONS FOR A GENERAL LOGIC STRUCTURE FOR CUSTOM LSI **c33**
M. Sievers *In its* The Deep Space Network 15 Oct. 1979 p 66-73 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 09C

A reliability model is presented that includes the possibility of undetected manufacturing flaws. This model is more accurate than models that consider only so-called wear-out failures. It may be used to indicate how much preinstallation test coverage is necessary to guarantee a given installed reliability. M.M.M.

N80-10251*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
FREQUENCY DOWN-CONVERTERS AS APPLIED TO VLBI **c32**
N. C. Ham *In its* The Deep Space Network 15 Oct. 1979 p 74-82 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 20N

The frequency conversion of a received radio frequency spectrum, from an extra galactic radio source down to video-band frequencies to facilitate data recording or transmission is described. A converter design is shown to minimize error contribution to the received information through the use of combination analog and digital circuitry. M.M.M.

N80-10252*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE NOCC RADIO SCIENCE SUBSYSTEM: SYSTEM PERFORMANCE VALIDATION FOR THE DSN RADIO SCIENCE AND VERY LONG BASELINE INTERFEROMETRY (VLBI) SYSTEMS **c32**
A. L. Berman *In its* The Deep Space Network 15 Oct. 1979 p 83-92 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 17B

A functional description of the key characteristics, require-

ments, and operation of the Network Operation Control Center Radio Science Subsystem is provided. M.M.M.

N80-10253*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DESIGN OF A QUICK-LOOK DECODER FOR THE DSN (7,1/2) CONVOLUTIONAL CODE c32
C. A. Greenhall and R. L. Miller *In its* The Deep Space Network 15 Oct. 1979 p 93-101 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 17B

The decoder proposed for a 1200 bit/s telemetry link that will operate while the TDRSS is relaying the signal from the Galileo spacecraft is discussed. Design parameters and performance figures for the three functions of the decoder: acquisition of node synchronization, generation of the decoded bits, and estimation of channel quality. A.R.H.

N80-10254*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A REED-SOLOMON DEEDING PROGRAM FOR CORRECTING BOTH ERRORS AND ERASURES c61
R. L. Miller, T. K. Truong, B. Benjauthrit, and I. S. Reed *In its* The Deep Space Network 15 Oct. 1979 p 102-107 refs (For primary document see N80-10240 01-12)
(Grant AF-AFOSR-1798-75)
Avail: NTIS HC A09/MF A01 CSCL 09B

The software implementation of a simplified algorithm for decoding errors and erasures of Reed-Solomon (R-S) code words using the techniques of finite field transforms and continued fractions is described. In particular, random code words from the (255, 223, 33) R-S code over GF(2 to th 8th power) are corrupted by random error and erasure patterns, and decoded whenever theoretically possible. A matrix of execution times of this decoder under varying sets of errors and erasure patterns is also included. This matrix demonstrates the relative amounts of time required for decoding different error and erasure patterns, as well as the correctness of the algorithms and the software implementation. Author

N80-10255*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DSN TRACKING SYSTEM UPLINK FREQUENCY CONTROL c32
G. L. Spradlin *In its* The Deep Space Network 15 Oct. 1979 p 108-112 (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 17B

The failure of the Voyager 2 spacecraft receiver requires that the DSN maintain the communications link to the spacecraft by constantly tuning the uplink frequency to null the effects of Doppler. An implementation within the DSN Tracking System will provide automated uplink frequency control by using electrical interfaces to control the transmitted frequency directly from predictions. A.R.H.

N80-10256*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DSN CONSCAN: A VECTOR NOMENCLATURE AND METHOD FOR DETERMINING PARAMETER VALUES c61
T. H. Taylor and J. LuValle *In its* The Deep Space Network 15 Oct. 1979 p 113-122 ref (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 09B

For proper operation, CONSCAN requires the specification of four parameter values: The CONSCAN radius, the scan period, the loop phase angle, and CONSCAN gain. These values are manually entered into the antenna pointing subsystem computer prior to CONSCAN tracking. The values vary from station to station and are different for different tracking configurations at a single station. There is presently no standard procedure for determining these values. A vector system is developed and used to describe a procedure for determining CONSCAN parameter values. Vector notation expresses the CONSCAN algorithm in a neat, consistent package with the two vector components on an equal footing. Vector relations are more easily visualized than their algebraic equivalents. A.R.H.

N80-10257*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ANTENNA AZIMUTH BEARING MODEL EXPERIMENT c37
H. McGinness *In its* The Deep Space Network 15 Oct. 1979 p 123-131 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 13I

A reduced scale model was constructed of an antenna wheel and track azimuth bearing in which the supporting wheels are attached to the alidade base and the track is grouted onto a concrete foundation. Tests were conducted to determine wheel and track resistance to contact surface failure, grout strength, circumferential movement of track on its supporting grout, effect of a large temperature difference between the wheel supporting structure and the track, and the amount of the rolling resistance torque. The model was designed to produce a wheel cyclic loading approximately 3200 times as fast as that of an antenna prototype. Results are discussed. A.R.H.

N80-10258*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
RADIO FREQUENCY PERFORMANCE OF DSS 14 64-m ANTENNA AT X-BAND USING A DUAL HYBRID MODE FEED c32
A. J. Freiley *In its* The Deep Space Network 15 Oct. 1979 p 132-140 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 20N

The 64 meter antenna X-band system at DSS 14 was evaluated to determine the performance with the new dual hybrid mode feed. The peak system efficiency increased from 42.0 to 45.6 percent resulting in a 0.36 dB increase in antenna gain. The new measured gain is 71.6 dB. Antenna pointing, beamwidth, optimum subreflector focusing, and operating system temperature were unchanged from the previous feed. Some evidence of antenna aging is apparent (from the 1973 measurements reported earlier) both in peak gain and in the pointing angle at which the peak occurs. Author

N80-10259*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
AN EXPERIMENTAL INVESTIGATION OF THE EFFECTS OF ANTENNA POINTING ERRORS ON RANGE DELAYS c32
T. Y. Otoshi and T. H. Taylor *In its* The Deep Space Network 15 Oct. 1979 p 141-147 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 20N

The effect of antenna pointing errors on range and VLBI time delay measurements is investigated. A collimation tower is tested for the effects from ground multipath and near field errors. The causes for time delay changes occurring when the antenna pointing goes from boresight to off boresight are discussed. Near field effects and differences in antenna phase versus frequency responses at different look angles are examined. A.W.H.

N80-10260*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
S-BAND ULTRALOW-NOISE TRAVELING-WAVE MASER c36
D. Trowbridge and J. Loreman *In its* The Deep Space Network 15 Oct. 1979 p 148-154 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 20E

Two S band traveling wave maser systems (TWM) with effective input noise temperatures of 2.0K at 2295 MHz are evaluated. The cooled signal input transmission lines, superconducting magnets, and solid state pump which improved stability performance on the TWMs are described. Support equipment and instrumentation, including the operating controls and indicators, are examined and the performance requirements are discussed. A.W.H.

N80-10261*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
AN IMPROVEMENT IN FOURIER TRANSFORM ACCURACY c64
R. C. Bunce *In its* The Deep Space Network 15 Oct. 1979 p 155-160 (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01

Component summation addition to existing Fourier transform algorithms is described as a minor tool for accuracy improvement. The behavior of the process is demonstrated with a statistical model and the accuracy advantage is discussed. A.W.H.

N80-10262*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DSS RECEIVER THERMAL NOISE MODEL COMPARISONS c33
R. C. Bunce *In its* The Deep Space Network 15 Oct. 1979 p 161-168 (For primary document see N80-10240 01-12)

Avail: NTIS HC A09/MF A01 CSCL 09C

Three DSS receiver thermal noise models are compared to determine if changes in the test algorithm are required. The linear spectral density approximation, the EXACT algorithm, and the exponential approximation are the models investigated.

A.W.H.

N80-10263*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

DEEP SPACE NETWORK FEASIBILITY STUDY OF TERMINATING SOUTHERN CALIFORNIA EDISON ELECTRICAL SERVICE TO GOLDSTONE c14

J. L. Koh *In its* The Deep Space Network 15 Oct. 1979 p 169-175 (For primary document see N80-10240 01-12)

Avail: NTIS HC A09/MF A01 CSCL 14B

A cost comparison of purchased power versus generated power is discussed. Methods for waste energy recovery are examined and applications for the use of waste energy in heating and cooling systems are presented.

A.W.H.

N80-10264*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

X-BAND SAMPLING BY THE OCCULTATION DATA ASSEMBLY c32

R. B. Roth *In its* The Deep Space Network 15 Oct. 1979 p 178-179 (For primary document see N80-10240 01-12)

Avail: NTIS HC A09/MF A01 CSCL 20N

Extraneous peaks which appear in the power spectrum of X band radio data are investigated. The effects of the peaks on a carrier signal and on the filter bandpass characteristics are examined.

A.W.H.

N80-10265*# National Aeronautics and Space Administration, Washington, D. C.

SHORT DESCRIPTION OF MATHEMATICAL SUPPORT PROGRAMS FOR SPACE EXPERIMENTS IN THE INTERKOSMOS PROGRAM

P. Ye. Elyasberg Jun. 1979 25 p Transl. into ENGLISH of "Kratkoye Opisaniye Programm Matematicheskogo Obespecheniya Kosmicheskikh Eksperimentov v Ramkakh Programmy "Interkosmos", Rept. Pr-431 Acad. of Sci. USSR, Inst. of Space Res., Moscow, 1978 p 1-32 Transl. by Scientific Translation Service, Santa Barbara, Calif.

(Contract NASw-3198)

(NASA-TM-75629) Avail: NTIS HC A02/MF A01 CSCL 22A

A synopsis of programs of mathematical support designed at the Institute for Cosmic Research of the USSR Academy of Sciences for cosmic experiments being conducted in the Interkosmos Program is presented. A short description of the appropriate algorithm is given.

Author

N80-10266*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.

FEASIBILITY OF COMMERCIAL SPACE MANUFACTURING. PRODUCTION OF PHARMACEUTICALS. VOLUME 1: EXECUTIVE SUMMARY Final Report

9 Nov. 1978 22B p

(Contract NAS8-31353)

(NASA-CR-161324; MDC-E2104-Vol-1) Avail: NTIS HC A11/MF A01 CSCL 22A

The feasibility of the commercial manufacturing of pharmaceuticals in space is examined. The method of obtaining pharmaceutical company involvement, laboratory results of the separation of serum proteins by the continuous flow electrophoresis process, the selection and study of candidate products, and their production requirements is presented. Antihemophilic factor, beta cells, erythropoietin, epidermal growth factor, alpha-1-antitrypsin and interferon were studied. Production mass balances for antihemophilic factor, beta cells, and erythropoietin were compared for space verus ground operation.

A.W.H.

N80-10267*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.

FEASIBILITY OF COMMERCIAL SPACE MANUFACTURING. PRODUCTION OF PHARMACEUTICALS. VOLUME 2: TECHNICAL ANALYSIS Final Report

9 Nov. 1978 37 p refs

(Contract NAS8-31353)

(NASA-CR-161325; MDC-E2104-Vol-2) Avail: NTIS HC A03/MF A01 CSCL 22A

A technical analysis on the feasibility of commercial manufacturing of pharmaceuticals in space is presented. The method of obtaining pharmaceutical company involvement, laboratory results of the separation of serum proteins by the continuous flow electrophoresis process, the selection and study of candidate products, and their production requirements is described. The candidate products are antihemophilic factor, beta cells, erythropoietin, epidermal growth factor, alpha-1-antitrypsin and interferon. Production mass balances for antihemophelic factor, beta cells, and erythropoietin were compared for space versus ground operation. A conceptual description of a multiproduct processing system for space operation is discussed. Production requirements for epidermal growth factor of alpha-1-antitrypsin and interferon are presented.

A.W.H.

N80-10268*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.

FEASIBILITY OF COMMERCIAL SPACE MANUFACTURING. PRODUCTION OF PHARMACEUTICALS. VOLUME 3: PRODUCT DATA Final Report

9 Nov. 1978 191 p refs

(Contract NAS8-31353)

(NASA-CR-161326; MDC-E2104-Vol-3) Avail: NTIS HC A09/MF A01 CSCL 22A

The feasibility of commercial manufacturing of pharmaceuticals in space is analyzed and the study results are presented. The chronology of the study process is discussed. The separation of serum proteins by the continuous flow electrophoresis process is investigated. The production requirements of twelve candidate products including antihemophilic factor, beta cells, erythropoietin, epidermal growth factor, alpha-1-antitrypsin, and interferon are evaluated.

A.W.H.

N80-10269# Joint Publications Research Service, Arlington, Va.

GEOPHYSICS, ASTRONOMY AND SPACE, NO. 452

4 Sep. 1979 22 p Transl. into ENGLISH from various Russian articles

(JPRS-74125) Avail: NTIS HC A02/MF A01

Abstracts of scientific articles on astronomy, meteorology, oceanography, terrestrial geophysics, upper atmosphere and space research are presented. The space processing of intermetallics is examined. For individual titles, see N80-10270 through N80-10270.

N80-10270# Joint Publications Research Service, Arlington, Va.

ALLOYS OBTAINED IN A STATE OF WEIGHTLESSNESS

Ye. Savitskiy, L. Ivanov, and V. Zemskov *In its* Geophys., Astronomy and Space, No. 452 (JPRS-74125) 4 Sep. 1979 p 15-18 Transl. into ENGLISH from Aviasiya i Kosmonavtika (Moscow), no. 7, 1979 p 42-43 (For primary document see N80-10269 01-12)

Avail: NTIS HC A02/MF A01

The Splav-01 series of experiments conducted on Salyut-6 to study the processes melting and crystallization of semiconductor materials, metallic alloys, and glasses under weightlessness conditions are discussed. The processing of solid solutions of cadmium and mercury tellurides, of indium antimonide with bismuth, and of bismuth with antimony by direct crystallization yielded high microhomogeneity. Analysis of the microstructure of metallic alloys shows that under weightlessness liquation by weight is suppressed. The primary crystals of these phases are larger than terrestrial crystals and have more perfect facating. A metallic material formed from aluminum and bismuth revealed a structure which differs from that obtained on Earth. The liquation process, phase formation, and the interaction of metal melts with metals in the solid state which have a higher melting point were investigated for the following compositions: aluminum with solid tungsten and with solid copper, and tin with solid copper. By controlling liquation processes, glasses can be produced with more uniform composition and properties, or vice versa.

A.R.H.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

No abstracts in this category.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N80-10271# California Univ., Santa Barbara. Marine Science Inst.
A LOW VELOCITY WATER TUNNEL FOR BIOLOGICAL RESEARCH
A. C. Charters and S. Miles Anderson 3 Apr. 1979 29 p refs Backup document for AIAA Synoptic scheduled for publication in Journal of Hydronautics in Jan. 1980
(Grant NSF ENG-76-22720)
Avail: NTIS HC A03/MF A01

A water tunnel, developed for studies of the effects of water motion on the life processes of marine plants, produces a low-turbulence, uniform flow through the velocity range of 3 to 30 cm/sec, typical of oceanic water motions, in a working section 10 cm in diamter by 100 cm long, a size adequate for tests of most benthic algae. It is instrumented for recording flow field streamlines and for measuring velocity and turbulence. The design and operating characteristics of the tunnel and its instrumentation are discussed. Photographs of the flow over various test bodies and around a marine plant are included. A.R.H.

N80-10241*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
NETWORK FUNCTIONS AND FACILITIES
N. A. Renzetti *In its* The Deep Space Network 15 Oct. 1979 p 1-3 (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 14B

N80-10242*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
VOYAGER SUPPORT
J. E. Allen and H. E. Nance *In its* The Deep Space Network 15 Oct. 1979 p 4-9 ref (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 14B

N80-10243*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PIONEER 11 SATURN ENCOUNTER SUPPORT
G. M. Rockwell *In its* The Deep Space Network 15 Oct. 1979 p 10-20 ref (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 14B

N80-10247*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DEMONSTRATION OF REMOTE CLOCK MONITORING BY VLBI, WITH THREE BASELINE CLOSURE
C. M. Cheetham, W. J. Hurd, J. W. Layland, G. A. Madrid, and T. P. Yunck *In its* The Deep Space Network 15 Oct. 1979 p 40-53 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 14B

N80-10283*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DEEP SPACE NETWORK FEASIBILITY STUDY OF TERMINATING SOUTHERN CALIFORNIA EDISON ELECTRICAL SERVICE TO GOLDSTONE
J. L. Koh *In its* The Deep Space Network 15 Oct. 1979 p 169-175 (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 14B

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N80-10272*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACELAB PAYLOAD ACCOMMODATION HANDBOOK. APPENDIX B: STRUCTURE INTERFACE DEFINITION MODULE
31 Jul. 1978 354 p
(NASA-TM-80808; ESA-SLP/2104-2-Issue-1) Avail: NTIS HC A16/MF A01 CSCL 22B

The mechanical interfaces between Spacelab and its payload are defined. The envelopes available for mounting payload hardware are specified together with the standard structural attachment interfaces. Overall load capabilities and the local load capabilities for individual attachment interfaces are defined for the standard mounting locations. The mechanical environment is defined and the mechanical interfaces between the payload and the EPDS, CDMS and ECS are included. A.W.H.

N80-10273*# National Aeronautics and Space Administration, Washington, D. C.
STUDY OF PERIODIC MOTIONS OF A SATELLITE WITH A MAGNETIC DAMPER
Yu. A. Sadov and A. D. Teterin Aug. 1979 29 p refs Transl. into ENGLISH of Preprint no. 35 (Moscow), 1979 32 p Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Academy of Sciences (USSR), Moscow
(Contract NASw-3199)
(NASA-TM-75667) Avail: NTIS HC A03/MF A01 CSCL 22A

The motion of a satellite with a magnetic damper in the plane of a circular polar orbit is studied. The asymptotics of periodic solutions are constructed for a satellite close to axisymmetric and the radius of convergence is evaluated for the power series obtained. In a broad range of values of parameters, a periodic solution is obtained by numerical integration of equations of motion of the satellite. The asymptotics of a bifurcated curve obtained (the curve on which origin of a pair of periodic solutions occurs) in the space of the parameters agrees well with the results of numerical computation with all physical values of these parameters. A breakdown is made of the space of the initial data of phase variables in the field of effect of different types of periodic motion. Author

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

N80-10274# Committee on Science and Technology (U. S. House).
OVERSIGHT: SPACE SHUTTLE COST, PERFORMANCE, AND SCHEDULE REVIEW
Washington GPO 1979 214 p Hearing before the Subcomm. on Space Sci. and Applications of the Comm. on Sci. and Technol., 96th Congr., 1st Sess., 28 Jun. 1979
(GPO-50-365) Avail: Subcomm. on Space Sci. and Applications

A congressional report on the space shuttle cost, performance, and schedule review is presented. Cost estimates and analysis of the space shuttle program is discussed. Budget appropriations are examined. A.W.H.

N80-10275*# Axiomatix, Los Angeles, Calif.
SHUTTLE ORBITER KU-BAND RADAR/COMMUNICATIONS SYSTEM DESIGN EVALUATION: HIGH GAIN ANTENNA/WIDEBEAM HORN Interim Report

R. Iwasaki, J. Dodds, and P. Broad 31 Aug. 1979 52 p ref
(Contract NAS8-15795)
(NASA-CR-160316; R7908-5) Avail: NTIS HC A04/MF A01 CSCL 22B

The physical characteristics of the high gain antenna reflector and feed elements are described. Deficiencies in the sum feed are discussed, and lack of atmospheric venting is posed as a potential problem area. The measured RF performance of the high gain antenna is examined and the high sidelobe levels measured are related to the physical characteristics of the antenna. An examination of the attributes of the feed which might be influenced by temperature extremes shows that the antenna should be insensitive to temperature variations. Because the feed support bipod structure is considered a significant contributor to the high sidelobe levels measured in the azimuth plane, pod relocation, material changes, and shaping are suggested as improvements. Alternate feed designs are presented to further improve system performance. The widebeam horn and potential temperature effects due to the polarizer are discussed as well as in the effects of linear polarization on TDRS acquisition, and the effects of circular polarization on radar sidelobe avoidance. The radar detection probability is analyzed as a function of scan overlap and target range. A.R.H.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

N80-10276*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
SHUTTLE ORBITER RADAR CROSS-SECTIONAL ANALYSIS
Dale W. Cooper and Robert James (James and Associates) Oct. 1979 44 p refs
(Contract NAS4-2460)
(NASA-TM-72870; H-1095) Avail: NTIS HC A03/MF A01 CSCL 17I

Theoretical and model simulation studies on signal to noise levels and shuttle radar cross section are described. Pre-mission system calibrations, system configuration, and postmission system calibration of the tracking radars are described. Conversion of target range, azimuth, and elevation into radar centered east north vertical position coordinates are evaluated. The location of the impinging rf energy with respect to the target vehicles body axis triad is calculated. Cross section correlation between the two radars is presented. A.W.H.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N80-10277*# TRW Defense and Space Systems Group, Redondo Beach, Calif.
IMPLICATIONS OF POSSIBLE SHUTTLE CHARGING
William W. L. Taylor Oct. 1979 16 p refs
(Contract NAS8-32580)
(NASA-CR-161283; Rept-30387-6016-RU-00) Avail: NTIS HC A02/MF A01 CSCL 22B

Shuttle charging is discussed and two analyses of shuttle charging are performed. The first predicts the effective collecting area of a wire grid, biased with the respect to the potential of the magnetoplasma surrounding it. The second predicts the intensity of broadband electromagnetic noise that is emitted when surface electrostatic discharges occur between the beta cloth and the wire grid sewn on it. A.W.H.

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N80-10278* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PASSIVE PROPELLANT SYSTEM Patent
Donald A. Hess (McDonnell-Douglas Corp., St. Louis), William W. Regnier (McDonnell-Douglas Corp., St. Louis), and Virgil L. Jacobs, inventors (to NASA) (McDonnell-Douglas Corp., St. Louis) Issued 25 Sep. 1979 6 p Filed 11 Jul. 1978 Sponsored by NASA
(NASA-Case-MFS-23642-1; US-Patent-4,168,718; US-Patent-Appl-SN-923758; US-Patent-Class-137-177; US-Patent-Class-137-590; US-Patent-Class-137-574; US-Patent-Class-137-576; US-Patent-Class-137-209; US-Patent-Class-244-135R) Avail: US Patent and Trademark Office CSCL 21H

A passive propellant acquisition and feed system is disclosed which acquires and feeds gas-free propellant in low or zero-g environments during orbital maneuvers and retains this propellant under high axially directed acceleration such as may be experienced during launch of a space vehicle and orbit-to-orbit transfer is described. The propellant system includes a dual compartment propellant tank with independent surface tension acquisition channels in each compartment to provide gas-free flow of pressurized liquid propellant from one compartment to the other in one direction only.

Official Gazette of the U.S. Patent and Trademark Office

N80-10279*# California Univ., Livermore. Lawrence Livermore Lab.
PROPELLANT DRIVEN TURBULENT INTERIOR BALLISTICS AND WALL EROSION
A. C. Buckingham Nov. 1978 31 p refs Presented at the AIAA Aerospace Sciences Meeting, New Orleans, 15-17 Jan. 1979
(Contract W-7405-eng-48)
(UCRL-81289; Conf-790102) Avail: NTIS HC A03/MF A01

Numerical simulations of the multidimensional, unsteady, erosive hot flow environment in a gun barrel are discussed. Turbulence, gas phase and gas surface thermochemistry, radial flow nonuniformities, and gas-borne particulates are considered in the computational models. Initial conditions include finite turbulence distributions inferred from direct turbulence computations and experiments. The turbulence modeling discussed is, however, restricted to two equation closure in conjunction with the time-averaged Navier-Stokes equations. Finite rate and equilibrium gas phase and gas surface chemical kinetics are included in the modeling of the erosion mechanisms active near bare and protectively coated gun tube walls. Particular features

suggested by the simulations, including the effects of radial nonuniformities and the coupling of core flow and boundary layer turbulence are summarized. DOE

N80-10280# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
TECHNICAL EVALUATION REPORT ON THE PROPULSION AND ENERGETICS PANEL 53RD SYMPOSIUM ON SOLID ROCKET MOTOR TECHNOLOGY
M. Barrere (ONERA, Chatillon sous Bagneux, France), W. H. Desinger (Dynamit Nobel AG, Cologne), and A. Homburg (Dynamit Nobel AG, Cologne) Sep. 1979 14 p refs
(AGARD-AR-151) Avail: NTIS HC A02/MF A01

The present situation in the field of solid propellant rocketry is discussed with focus on propellant steady state burning, propellant unsteady burning, and rocket motor technology, topics covered include (1) ignition, extinction and internal ballistics; (2) burn rate modelling and combustion of metal; (3) New Propellants; (4) combustion instability; (5) heat transfer and materials; and (6)testing and instrumentation. A.R.H.

N80-10281# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
SOLID ROCKET MOTOR TECHNOLOGY
Jul. 1979 523 p refs In ENGLISH; partly in FRENCH Presented at the 53d Meeting of the AGARD Propulsion and Energetics Panel, Oslo, 2-5 Apr. 1979
(AGARD-CP-259; ISBN-92-835-0243-4) Avail: NTIS HC A22/MF A01

The reports presented at the conference are presented. Topics discussed include: (1) ignition, extinction and internal ballistics, (2) burn rate modeling, (3) combustion instability, (4) heat transfer and materials, and (5) testing and instrumentation. For individual titles, see N80-10282 through N80-10316.

N80-10282# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
RESEARCH IN THE FIELD OF SOLID PROPELLANT ROCKETS: A SURVEY
Marcel Barrere *In* AGARD Solid Rocket Motor Technol. Jul. 1979 28 p refs In FRENCH; ENGLISH summary (For primary document see N80-10281 01-20)
Avail: NTIS HC A22/MF A01

Current research of interest to solid propellant rocket manufacturers for military applications are reviewed. The analysis deals mainly with the combustion of propellants and the nature of burned products, as well as their impact on performances and the behavior of nozzles and casings. The combustion research is divided into two parts: the steady and the unsteady regime of the combustion chamber. The burning rate is studied of the propellant which plays an important role in the optimization of the propulsion system, in particular its level, its evolution with the pressure and its sensivity to the grain temperature. The influence of the gas velocity along the surface and acceleration effects are also dealt. The flame propagation in cracks and their initiation are analyzed. In the unsteady regime of combustion, the response of the propellant to pressure and velocity fluctuations are studied. Experimental and theoretical works on the determination of the transfer function are dealt with. F.O.S.

N80-10283# Hercules, Inc., McGregor, Tex.
SOLID ROCKET MOTOR DESIGN AUTOMATION TECHNOLOGY
W. G. Haymes, J. E. Williamson, S. E. McClendon, and W. T. Brooks *In* AGARD Solid Rocket Motor Technol. Jul. 1979 15 p refs (For primary document see N80-10281 01-20)
Avail: NTIS HC A22/MF A01

The status of Solid Rocket Motor Design Automation Technology is reported. The total scope is reviewed, from initial preliminary design techniques to optimize rocket motor performance, mass, and envelope characteristics to those procedures used in final design activity. The latter include internal ballistics and grain design; combustion stability prediction; structural, thermal, and mass property analyses; and the like. The direction of current work in the United States of America is outlined. F.O.S.

N80-10284# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
IGNITION AND EXTINCTION OF SOLID PROPELLANTS
Guy Lengelle, Pierre Mentre, Joel Guernigou, Alain Bizot, and Yves Maisonneuve *In* AGARD Solid Rocket Motor Technol. Jul. 1979 16 p refs In FRENCH; ENGLISH summary (For primary document see N80-10281 01-20)
Avail: NTIS HC A22/MF A01

Activities are reported which were carried out at ONERA on ignition and extinction relative both to the propellant per se and to the motor grain with a given type of igniter. The ignition characteristics of composite and double base propellants were investigated by exposing samples to arc generated neutral gas jet as well as to aluminized, propellant motor exhaust. The means used to detect ignition were visualization, I.R. pyrometer and ultrasonic transducers continuously monitoring the thickness of the sample. With the various types of heating (convection - conduction, particles impact) it was found that the ignition laws remain the same, controlled by the degradation characteristics of the propellant components. The various experimental techniques used in scaled motors for the investigation of propellant ignition and of flame spreading are described, particularly fluxmeters. Examples of applications of these techniques to the study of the ignition of motors with composite as well as double based propellant grains, are presented. The extinction characteristics, low pressure deflagration limit and extinction under depressurization, of various composite propellants were studied revealing the influence of the composition parameters: particles size, nature of the binder, presence of additives. F.O.S.

N80-10285# Politecnico di Milano (Italy).
IGNITION AND EXTINCTION OF SOLID ROCKET PROPELLANTS
L. DeLuca, L. Galfetti, and C. Zanotti *In* AGARD Solid Rocket Motor Technol. Jul. 1979 14 p refs (For primary document see N80-10281 01-20)
Avail: NTIS HC A22/MF A01

Dynamic burning effects associated with ignition and extinction of solid rocket propellants are examined within the framework of a thermal theory of heterogeneous combustion and for quasi-steady gas phase. A nonlinear burning stability analysis was carried out via an integral method. This predicts that, for a given set of operating conditions, a well defined critical surface temperature exists below which extinction of a burning propellant necessarily follows independently on its past history. These critical surface temperature values define a lower dynamic stability boundary strictly depending on the propellant nature, but affected by the operating conditions. The analysis is based on an asymptotic stability criterion always valid for static (random disturbances) stability problems, but restricted to forcing functions levelling off in time for dynamic (external disturbances) stability. Under these circumstances, the lower dynamic stability boundary is independent on the nature of the transient (pressure or radiation driven), the shape in time of the forcing function (linear, exponential, parabolic, etc.) and the rate of change of the forcing function (even variable). The relevance of the lower dynamic stability boundary to ignition transients is discussed. Computer simulated runs show a very good agreement with the analytical predictions. Author

N80-10286# Aerospace Corp., El Segundo, Calif.
SOLID PROPELLANT SPECIFIC IMPULSE PREDICTION
Ellis M. Landsbaum and Manuel P. Salinas *In* AGARD Solid Rocket Motor Technol. Jul. 1979 11 p refs (For primary document see N80-10281 01-20)
Avail: NTIS HC A22/MF A01

The methods for the theoretical prediction of delivered specific impulse are relatively well-known. They involve computing the losses due to two-phase flow, divergence, boundary layer, kinetics, nozzle submergence and combustion efficiency. The largest computed loss in typical aluminized solid propellants is the two-phase flow loss; this computation also has the largest uncertainty because the particle size and distribution are not known precisely. A correlation of mean particle diameter versus throat diameter from experimental data was used with the solid rocket performance prediction program (SPP) to predict the propellant specific impulse of a number of motors. These predictions are compared to the experimental values. The results

indicate that the specific impulse efficiency appears to be an inherent property of the propellant. In addition, the experimental specific impulse and specific impulse efficiency were statistically correlated against throat diameter and expansion ratio for propellants of similar oxidizer and aluminum content. These correlations are as accurate as the longer, more expensive, theoretical analysis. In addition to specific impulse prediction, the equations are useful in optimization of motor design. Author

N80-10287# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
A SIMPLE METHOD TO ESTIMATE THE INFLUENCE OF A SMALL VARIATION IN THE THROAT AREA ON THE PERFORMANCE OF SOLID ROCKETS
H. F. R. Schoyer *In* AGARD Solid Rocket Motor Technol. Jul. 1979 7 p refs (For primary document see N80-10281 01-20)
Avail: NTIS HC A22/MF A01

A technique is presented for the rapid estimation of rocket performance for different nozzle throat areas and the mutual dependence of motor parameters. The method is based on linearization of the mean ballistic variables with respect to the variation in throat area. The variation of the thrust, specific impulse, burning time, mass flow, and total impulse are predicted. These predictions are compared with predictions by a computer program for the internal ballistics of solid rocket motors and show good agreement. J.M.S.

N80-10288# Dynamit Nobel A.G., Cologne (West Germany).
INTERNAL BALLISTIC PROBLEMS OF HELMUT HIGHLY ACCELERATED SOLID PROPELLANT ROCKETS
Walter Diesinger *In* AGARD Solid Rocket Motor Technol. Jul. 1979 11 p refs (For primary document see N80-10281 01-20)
Avail: NTIS HC A22/MF A01

The state of the art in the field of internal ballistics in an accelerated (> 1g) environment is given. It is shown how problems arising with high acceleration may be solved. J.M.S.

N80-10289# Dynamit Nobel A.G., Troisdorf (West Germany).
PROPELLANT IGNITER DEVELOPMENT PROBLEMS
Hans Florin *In* AGARD Solid Rocket Motor Technol. Jul. 1979 24 p (For primary document see N80-10281 01-20)
Avail: NTIS HC A22/MF A01

Igniters for propelling charges are described. The light artillery rocket and anti-submarine training rocket serve as examples of the electric and internal ballistics data of igniters. Special attention is given to the corresponding safety requirements. The mechanical and electrostatic safety is covered in connection with the general environmental compatibility. Some EMC tests of igniters are included. J.M.S.

N80-10290# Propellants, Explosives and Rocket Motor Establishment, Westcott (England).
SOME MEASUREMENTS OF IGNITION DELAY AND HEAT TRANSFER WITH PYROGEN IGNITERS
A. R. Hall, G. R. Southern, and D. Sutton *In* AGARD Solid Rocket Motor Technol. Jul. 1979 9 p refs (For primary document see N80-10281 01-20)
Avail: NTIS HC A22/MF A01

Measurements were made of ignition delay and the corresponding heat flux with a range of single orifice pyrogens charge with propellant and fired axially in small motors in order to elucidate design priciples. Ignitions were inferred from pressure-time records of both pyrogen and main motor and mean heat flux with a range of single orifice pyrogens charged with propellant and fired axially in small motors in order to elucidate design principles. Ignitions were inferred from pressure-time records of both pyrogen and main motor and mean heat fluxes were calculated from the total temperature rise of copper capsules set in dummy motor charges. The motor ignition delay, the mass rate of pyrogen discharge, and the mean heat flux were correlated. Comparison of igniters at the same values of the mass rate of pyrogen discharge, revealed that ignition delays tended to be longer if igniter products contained condensed phase and pyrogens performed as well as pyrotechnics. J.M.S.

N80-10291# Propellants, Explosives and Rocket Motor Establishment, Westcott (England). Solid Propellant Motors Div.
BOUNDARY LAYER MODELS OF EROSIVE BURNING
R. C. Parkinson and P. D. Penny *In* AGARD Solid Rocket Motor Technol. Jul. 1979 13 p refs (For primary document see N80-10281 01-20)
Avail: NTIS HC A22/MF A01

It is shown that erosive burning can be correlated by a boundary layer 'blow off' criterion. A momentum integral boundary layer theory is used to predict the boundary layer reattachment point in a rocket motor conduit, with acceleration of the combustion gases in the conduit as an important modifying force. The energy balance in the boundary layer is considered providing a means of relating boundary layer thickness with burning rate. Both normal and erosive burning effects are included. J.M.S.

N80-10292# Cohen (Norman) Professional Services, Redlands, Calif.
COMPOSITE PROPELLANT BURN RATE MODELING
Norman S. Cohen *In* AGARD Solid Rocket Motor Technol. Jul. 1979 21 p refs (For primary document see N80-10281 01-20)
Avail: NTIS HC A22/MF A01

The current status of the steady-state combustion modeling of composite solid propellants is reviewed. Emphasis is placed upon revisions of original Beckstead-Derr-Price (BDP) model premises as applicable to simple monomodal AP propellants. Extensions to more complicated propellants (multimodal, etc.) are discussed. Results are presented which show parametric trends and comparisons with data. Areas of agreement and disagreement, deficiencies, and continuing developments are pointed out. J.M.S.

N80-10293# Bayern-Chemie G.m.b.H., Ottobrunn (West Germany).
EROSIVE AND TRANSIENT BURNING EFFECTS ON PERFORMANCE PREDICTION ACCURACY OF TACTICAL ROCKETS
H. P. Sauerwein, A. Lampert, and R. H. Schmucker *In* AGARD Solid Rocket Motor Technol. Jul. 1979 11 p refs (For primary document see N80-10281 01-20)
Avail: NTIS HC A22/MF A01

An erosive burning model which allows performance prediction without additional empirical parameters is presented. A sensitivity analysis which uses the data of small tactical rockets shows the effects of the various geometric and ballistic parameters and the variation of pressure and thrust history due to transient effects. M.M.M.

N80-10294# Princeton Univ., N. J.
ALUMINUM COMBUSTION UNDER ROCKET MOTOR CONDITIONS
Leonard H. Caveny and Alon Gany *In* AGARD Solid Rocket Motor Technol. Jul. 1979 13 p refs (For primary document see N80-10281 01-20)
(Grant AF-AFOSR-3104-76)
Avail: NTIS HC A22/MF A01

Combustion processes of aluminum particles emitted from the surface of solid propellants were studied under rocket motor, cross-flow conditions as well as strand burning conditions. High-speed, color photographs were taken of Al_2O_3 agglomerates forming on the surface, moving along the surface, entering the flow field, and breaking-up in nozzles. Experiments were conducted for cross-flow velocities as high as 30 m/s and pressures between 2 and 10 MPa. Agglomerate size distributions were obtained by direct measurements from the films. Analysis of size distributions of the agglomerates leaving the surface reveals that the following parameters decrease with increasing pressure: collision frequency on the surface, the agglomerate stay time on the surface, and mean agglomerate size. Increasing the cross-flow velocity decreases the mean agglomerate size. However, chamber pressure has the most pronounced effect on agglomerate size. M.M.M.

N80-10295# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
COMBUSTION OF ALUMINUM IN SOLID PROPELLANT FLAMES
E. W. Price *In* AGARD Solid Rocket Motor Technol. Jul. 1979 15 p refs (For primary document see N80-10281 01-20)

Avail: NTIS HC A22/MF A01

The behavior of aluminum in the combustion zone, the mechanisms causing this behavior, and the significance to motor performance, with particular emphasis on ammonium perchlorate-hydrocarbon binder-aluminum propellants are described. The features of aluminum behavior involve retention, concentration, sintering and coalescence of most particles on the propellant burning surface. This is followed by detachment and ignition of the agglomerate material, burning in the combustor cavity with formation of a characteristic population of oxide droplets in a diameter distribution with most droplets $0.1 < D < 50$ micrometers. M.M.M.

N80-10296# Naval Weapons Center, China Lake, Calif. Aerothermochemistry Div.

THE ROLE OF PARTICULATE DAMPING IN THE CONTROL OF COMBUSTION INSTABILITY BY ALUMINUM COMBUSTION

Karl J. Kraeutle, H. B. Mathes, and Ronald L. Derr *In* AGARD Solid Rocket Motor Technol. Jul. 1979 14 p refs (For primary document see N80-10281 01-20)

Avail: NTIS HC A22/MF A01

Methods used to minimize the risk of combustion instability in rocket motors by tailoring the oxide particle production are summarized. A brief discussion of particulate damping theory is given. Damping measurement with the T-burner and the procedure of damping calculation presently in use at the Naval Weapons Center are presented. The importance of particle size analysis for damping calculations is discussed. Particle size analysis methods are described which consider the peculiarities of combustion residues. Examples of size distributions and damping calculations are given. The results show that the theory adequately describes damping by aluminum oxide particles and that damping calculations supply information necessary for tailoring of aluminum oxide particle sizes toward increased damping. M.M.M.

N80-10297# Bayern-Chemie G.m.b.H., Aschau (West Germany).

GAS GENERATOR PROPELLANTS FOR AIR-TO-AIR MISSILES

R. A. H. Strecker and D. Linde *In* AGARD Solid Rocket Motor Technol. Jul. 1979 11 p ref (For primary document see N80-10281 01-20)

Avail: NTIS HC A22/MF A01

NB 410-propellants, representative of gas generator propellants which are superior to propellants containing unstabilized ammonium nitrate are presented. These NB 410-propellants are especially suited for applications where systems are exposed to a large temperature range and frequent temperature cycling such as air-to-air missiles. M.M.M.

N80-10298# Naval Surface Weapons Center, White Oak, Md.

NEW BINDER SYSTEM FOR COMPOSITE SOLID PROPELLANTS

Carl Gotzmer and Nat Seidan (Naval Ordnance Station, Indian Head, Md.) *In* AGARD Solid Rocket Motor Technol. Jul. 1979 12 p (For primary document see N80-10281 01-20) (SF131332307)

Avail: NTIS HC A22/MF A01

A binder system for application to both castable and extrudable composite solid propellants as developed and tested for several motor sizes at typical service temperatures. The binder system consists of a low acrylonitrile type carboxy terminated polybutadiene acrylonitrile liquid copolymer which is crosslinked with di- and tri-epoxides. A dual epoxide crosslinking system is employed to permit broad adjustment of propellant modulus for various applications. This binder system provides propellants with relative insensitivity to atmospheric moisture during processing and a generous pot life. Propellant costs are fully competitive with those of carbox or hydroxy terminated polybutadiene binder propellants. K.L.

N80-10299# Institut fuer Chemie der Treib- und Explosivstoffe, Pfinztal (West Germany).

THE AGEING BEHAVIOUR OF SOLID ROCKET PROPELLANTS REGARDING THEIR MECHANICAL PROPERTIES

D. Schmitt *In* AGARD Solid Rocket Motor Technol. Jul. 1979 8 p (For primary document see N80-10281 01-20)

Avail: NTIS HC A22/MF A01

Composite and double base rocket propellant samples were aged at elevated temperatures to determine the effects of aging on tensile strength and deformation properties. Results were extrapolated to service temperatures for double base propellants. In composite propellants aging resulted in a change of the viscoelastic properties which manifested itself like the embrittlement of a material: strength increased as deformation properties decreased. This change in mechanical properties decreased from the outside to the inside. Hence, particular attention must be given to surface aging. K.L.

N80-10300# Centre de Recherches du Bouchet, Vert de Petit (France).

IMPROVING THE ALL WEATHER BALLISTIC AND MECHANICAL PROPERTIES OF SMOKELESS PROPERGOLS [AMELIORATION DES PROPRIETES BALISTIQUES ET DES PROPRIETES MECANIQUES TOUS TEMPS DES PROPERGOLS SANS FUMEE]

A. Davenas *In* AGARD Solid Rocket Motor Technol. Jul. 1979 14 p refs In FRENCH (For primary document see N80-10281 01-20)

Avail: NTIS HC A22/MF A01

The effect of RDX and HMX as well as the effect of the ratio of energetic plasticizers and of reticulation on the thermodynamic, kinematic, and mechanical properties of cast double-base propellants was investigated. Results are compared with the properties of composite propellants with hydrocarbon and HMX binders. The present characteristics of the propellants and the desired improvements are described. Transl. by A.R.H.

N80-10301*# California Inst. of Tech., Pasadena.

SOME PROBLEMS OF NONLINEAR WAVES IN SOLID PROPELLANT ROCKET MOTORS

F. E. C. Culick *In* AGARD Solid Rocket Motor Technol. Jul. 1979 15 p refs (For primary document see N80-10281 01-20) (Contract NAS7-100)

Avail: NTIS HC A22/MF A01

An approximate technique for analyzing nonlinear waves in solid propellant rocket motors is presented which inexpensively provides accurate results up to amplitudes of ten percent. The connection with linear stability analysis is shown. The method is extended to third order in the amplitude of wave motion in order to study nonlinear stability, or triggering. Application of the approximate method to the behavior of pulses is described. K.L.

N80-10302# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

RECENT ONERA STUDIES ON COMBUSTION INSTABILITIES IN SOLID PROPELLANT ROCKET MOTORS

Paul Kuentzman *In* AGARD Solid Rocket Motor Technol. Jul. 1979 24 p refs In FRENCH; ENGLISH summary (For primary document see N80-10281 01-20)

Avail: NTIS HC A22/MF A01

Experimental and numerical techniques to solve the problem created by combustion instabilities in solid propellant motors are reviewed. A study of the similarity of combustion instabilities carried out on large size engines with geometrically complex grain revealed some instabilities. In view of the poor agreement between the observed and predicted phenomena characteristics, it was proposed to conduct tests on a reduced scale. The main results obtained and the limitation of this method are presented. K.L.

N80-10303# Naval Weapons Center, China Lake, Calif. Aerothermochemistry Div.

APPLICATION OF COMBUSTION INSTABILITY RESEARCH TO SOLID PROPELLANT ROCKET MOTOR PROBLEMS

Ronald L. Derr, H. B. Mathes, and James E. Crump *In* AGARD Solid Rocket Motor Technol. Jul. 1979 12 p refs (For primary document see N80-10281 01-20)

Avail: NTIS HC A22/MF A01

Experimental and analytical tools for minimizing the risk of combustion instability in solid rocket motors are reviewed and examples of practical application to motors are discussed. Both successful and unsuccessful examples are described for large and small rocket motors. Laboratory characterization of practice

damping associated with a metallized propellant and optimization of particle damping to eliminate pressure oscillations in a tactical solid rocket motor are discussed. In addition, prediction of motor behavior and comparison with motor firing results are presented for solid rocket motors used in the NASA Space Shuttle system. The practical state of the art of combustion instability technology is assessed. K.L.

N80-10304# Politecnico di Milano (Italy). Centro di Studio per Ricerche sulla Propulsione e sulla Energetica.
SELF-SUSTAINED OSCILLATORY COMBUSTION OF SOLID ROCKET PROPELLANTS
L. DeLuca *In* AGARD Solid Rocket Motor Technol. Jul. 1979 14 p refs (For primary document see N80-10281 01-20)
Avail: NTIS HC A22/MF A01

Self-sustained oscillatory burning of solid rocket propellants is considered, within the framework of a thermal theory of heterogeneous combustion and for quasi-steady gas phase. A nonlinear burning stability analysis, carried out via an integral method, predicts the existence of three well defined static regimes: stationary, self-sustained oscillatory, and extinguished. The self-sustained oscillatory solution is related to large values of surface heat release; these values increase with pressure. The burning rate oscillations are of thermokinetic nature and feature characteristic spikes. The existence and the properties of these oscillations can be analytically predicted; they strictly depend on the operating conditions. Computer simulated runs show a very good agreement with the analytical expectations. Identical self-sustained oscillations were observed following different transients to the same final set of operating conditions. Frequencies, increasing with pressure, of the order of 100 Hz were found at pressures of the order of 10 atm; amplitudes were found to decrease with pressure. The same basic features can be observed for different flame models. R.E.S.

N80-10305# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
LOW FREQUENCY OSCILLATORY COMBUSTION: EXPERIMENTS AND RESULTS
H. F. R. Schoeyer *In* AGARD Solid Rocket Motor Technol. Jul. 1979 16 p refs (For primary document see N80-10281 01-20)
Avail: NTIS HC A22/MF A01

Combustion experiments were carried out with double base and composite propellants. There were noticeable differences between the oscillatory combustion of the double base and the composite propellant. Chuffing was frequently observed with the double base propellants, while dp/dt extinguishment was observed in the majority of cases of oscillatory combustion of the composite propellant. Both propellants displayed a relation between the frequency of the oscillations and the mean pressure. From the experiments, stability boundaries were estimated for both types of propellants. In addition, the imaginary part of the response function was estimated for the composite propellant. A computer program was developed and applied successfully for digital data reduction of the experimental results. R.E.S.

N80-10306# Defence Research Establishment Valcartier (Quebec). Centre de Recherches pour la Defense
NONLINEAR COMBUSTION INSTABILITY IN SOLID PROPELLANT ROCKET MOTORS: INFLUENCE OF GEOMETRY AND PROPELLANT FORMULATION
P. M. Hughes and D. L. Smith *In* AGARD Solid Rocket Motor Technol. Jul. 1979 26 p refs (For primary document see N80-10281 01-20)
Avail: NTIS HC A22/MF A01

The characteristics of the longitudinal nonlinear (or steep-fronted shock) mode of instability were compared in a single size of motor for three different grain cross sections (cylindrical, star and slotted tubular) and three propellant formulations. The formulations were all based on a hydroxy-terminated polybutadiene binder, containing no aluminum and varying only in the level of burning rate catalyst and oxidizer distribution. It was found that the degree of instability decreased with increasing burning rate and was affected by the number of waves propagating. No correlation could be established between the strength of the unstable wave and either the formulation or grain cross section. A low level acoustic wave form was observed to transition naturally into a steep fronted, shock type waveform. The growth of the shock waveform was studied from initiation to steady state and it was found that the growth rate generally increased with decreasing propellant burning rate. The growth mechanism tended to be a complicated one in the earlier stages of a particular firing (before expending 50% of its propellant mass); however, it can generally be stated that a pulse will grow at a faster rate in the later stages of a firing. R.E.S.

N80-10307# Imperial Metal Industries Ltd., Kidderminster (England).
THE SUPPRESSION OF COMBUSTION INSTABILITY BY PARTICULATE DAMPING IN SMOKELESS SOLID PROPELLANT MOTORS
G. I. Evans and P. K. Smith *In* AGARD Solid Rocket Motor Technol. Jul. 1979 11 p refs (For primary document see N80-10281 01-20)
Avail: NTIS HC A22/MF A01

An approach to the practical resolution of the problem of acoustic combustion instability without sacrificing performance in smokeless rocket motors is described. Experimental work shows that small quantities of refractory powder are very successful in suppressing combustion instability but that a wider range of particle sizes than is theoretically predicted proves to be effective. Manipulation of the size density function was shown to be an effective means of achieving maximum combustion stability with minimum amounts of exhaust smoke. R.E.S.

N80-10308# Bayern-Chemie G.m.b.H., Ottobrunn (West Germany).
MATERIAL PROBLEMS IN JET VANE THRUST VECTOR CONTROL SYSTEMS
D. Kampa, A. Weib, and R. H. Schmucker *In* AGARD Solid Rocket Motor Technol. Jul. 1979 10 p refs (For primary document see N80-10281 01-20)
Avail: NTIS HC A22/MF A01

Five different refractory material types were studied using a highly aluminized HTPB composite propellant. Of these, pure and composite ceramics exhibited insufficient thermal shock resistance, pure carbon showed extreme ablation and erosion. Specifically selected graphite, covered with a tungsten layer and reinforced by a tip of this material, performed well, but the data available were not adequate for systems' use. The best results were obtained with pure tungsten vanes, covered with a layer of low thermal conductivity to maintain structural rigidity. Tests with low aluminum loading propellants showed less severe problems so that molybdenum was sufficient. The results were applied to an experimental thrust vector control system with a low primary smoke HTPB composite propellant. By proper vane shaping, heat shielding and surface coating, a functional system was attained. R.E.S.

N80-10309# Propellants, Explosives and Rocket Motor Establishment, Waltham Abbey (England).
COMPOSITES IN FUTURE MOTOR HARDWARE: A RESEARCH VIEW
N. J. Parratt *In* AGARD Solid Rocket Motor Technol. Jul. 1979 10 p refs (For primary document see N80-10281 01-20)
Avail: NTIS HC A22/MF A01

The move from traditional materials to more recent concepts such as dual function composites and integrated construction in tactical motor design is traced. The question is then reviewed as to whether in fact the best use is being made of available materials, particularly in reducing weight and cost together. Suggestions as to how this might be done are then presented. It is concluded that particularly in the construction of motor cases, significant improvements can be made immediately with only minor changes in design, if supported by adequate measurement and prediction of any deterioration. R.E.S.

N80-10310# Societe Europeenne de Propulsion, Bordeaux (France).
PREDICTING THE BEHAVIOR OF PHENOLIC ABLATIVE MATERIALS [PREDICTION DU COMPORTEMENT DES MATERIAUX PHENOLIQUES ABLATIFS]
Claude Bonnet *In* AGARD Solid Rocket Motor Technol. Jul. 1979 16 p refs In FRENCH (For primary document see N80-10281 01-20)

Avail: NTIS HC A22/MF A01

Requirements for predicting the behavior of parts of a blast pipe made of phenolic materials throughout burn, the methods of fabricating composite materials and structures must be improved so that better reproductibility may be achieved. New analysis methods and computer programs must be used to reliably predict the mechanical and thermodynamic behavior of blast pipes under fire. The materials and temperatures under which they are used (ambient to 2500 C) must be characterized. Transl. by A.R.H.

N80-10311# Politecnico di Milano (Italy).

GAS PHASE VELOCITY MEASUREMENTS IN SOLID ROCKET PROPELLANTS BY LASER DOPPLER ANEMOMETRY

A. Coghe, L. DeLuca, G. L. Sensalari, and A. Volpi *In* AGARD Solid Rocket Motor Technol. Jul. 1979 14 p refs (For primary document see N80-10281 01-20)

Avail: NTIS HC A22/MF A01

A laser Doppler velocimetry (LDV) technique is described which performs velocity measurements in the gaseous region near the combustion surface of a burning solid rocket propellant. Several laser based optical techniques are examined which measure the condensed phase burning rate and the size of the particles carried away by the gas in the plume of the burning solid propellant. A steady state strand burner, with two symmetrical and opposite optical windows, developed for the LDV experiments, is described. The apparatus was applied to steady burning solid propellant. The application of the apparatus for unsteady situations is discussed. A.W.H.

N80-10312# United Technologies Corp., Sunnyvale, Calif. Chemical Systems Div.

PRESSURE AND VELOCITY RESPONSE FUNCTION MEASUREMENTS BY THE ROTATING VALVE METHOD

R. S. Brown and R. C. Waugh *In* AGARD Solid Rocket Motor Technol. Jul. 1979 17 p refs (For primary document see N80-10281 01-20)

(Contracts F04611-72-C-0007; F04611-74-74-C-0045; F49620-77-C-0048)

Avail: NTIS HC A22/MF A01

The rotating valve method which measures the pressure and velocity coupled response functions of solid propellants is discussed. The method which is based on producing pressure or velocity oscillations in a small combustion chamber by varying the area of one or two secondary exhaust nozzles in a periodic manner, is described. Analytical studies are described in which the relationship between the propellant combustion response characteristics and the dynamic chamber ballistics is developed. An experimental rotating valve apparatus was constructed and its performance compared with predictions under cold flow conditions. A.W.H.

N80-10313# Propellants, Explosives and Rocket Motor Establishment, Westcott (England).

ULTRASONIC IMAGING AS APPLIED TO NONDESTRUCTIVE TESTING OF ROCKET PROPELLANTS

D. S. Dean and D. T. Green *In* AGARD Solid State Rocket Motor Technol. Jul. 1979 13 p (For primary document see N80-10281 01-20)

Avail: NTIS HC A22/MF A01

An ultrasonic imaging technique, which is interface sensitive rather than dependent upon the amount of material missing, for nondestructive testing of rocket propellants is examined. A focused image obtained by holographic encoding or computational manipulation of the phase information of the ultrasonic field is used to determine defects in solid propellant charges. The holographic method, which uses parallel processing of information to produce a near real time image is described. The use of large scale integrated circuits and minicomputers in the imaging technique is evaluated. A.W.H.

N80-10314# Aerospace Corp., Los Angeles, Calif.

A GENERALIZED SOLID MOTOR DEVELOPMENT TEST APPROACH WITH APPLICATION TO IUS

Ernst Stampfl and D. H. May (Space and Missile Systems Organ., Los Angeles, Calif.) *In* AGARD Solid Rocket Motor Technol. Jul. 1979 14 p refs (For primary document see N80-10281 01-20)

Avail: NTIS HC A22/MF A01

The aspects of the inertial upper stage (IUS) solid motor propulsion test program are described, including the background and rationale leading to the baseline test approach that relies on overtesting. The background for the test approach is presented and a general description of IUS and its solid motors is given along with a delineation of system, motor, component, and material requirements. An overall perspective of the various test phases and their integration with each other and with the design requirements is given. Objectives, test approaches, and a summary of available results of the various test phases are discussed, including their correlation with requirements. Author

N80-10315# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.

THE USE OF STANDARDIZED TEST MOTORS AND LABORATORY TOOLS IN THE DEVELOPMENT OF MISSILE PROPULSION TECHNOLOGY

Richard R. Weiss *In* AGARD Solid Rocket Motor Technol. Jul. 1979 14 p (For primary document see N80-10281 01-20)

Avail: NTIS HC A22/MF A01

The development of standardized test motors and laboratory tools for the evaluation of solid rocket motor component capabilities and propellant behavior is discussed. The advantages and disadvantages offered by the use of standardized motors and laboratory tools are examined. The test motor families and combustion tools used at engine testing laboratories for missile propulsion technology development are reviewed. The rationale for their selection, design and use is provided along with a description of the devices themselves. A.W.H.

N80-10316# Propellants, Explosives and Rocket Motor Establishment, Westcott (England).

MEASUREMENT OF THRUST TRANSIENTS IN ROCKET MOTORS

D. S. Dean *In* AGARD Solid Rocket Motor Technol. Jul. 1979 12 p (For primary document see N80-10281 01-20)

Avail: NTIS HC A22/MF A01

Two systems for measuring the thrust transients in rocket motors are examined. Construction and calibration of the systems are described. The first system is designed to measure starting transients of large rocket motor if there is no significant change in the mass. The second system is designed for use with short burning time motors if the moving mass and its distance of free travel are kept within practical bounds. A.W.H.

N80-10034 Allerton Press, Inc., New York, N. Y.

ON STABILITY OF OPERATION OF LIQUID ROCKET ENGINE WITH TUBOPUMP ASSEMBLY (TPA)

F. D. Bairamov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 10-15 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4 1978 p 16-22 (For primary document see N80-10031 01-01)

Copyright. Avail: Allerton Press, Inc., 150 Fifth Avenue, New York, N. Y. 10011; $45.00

N80-10087 Allerton Press, Inc., New York, N. Y.

WARMUP OF LRE CHAMBERS WITH REGENERATIVE COOLING

V. V. Orlov *In its* Soviet Aeron., v. 22, no. 1 1979 p 102-104 ref Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 115-117 (For primary document see N80-10061 01-01)

Copyright. Avail: Allerton Press, Inc., 150 Fifth Ave., New York, N. Y. 10011; $50.00

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

No abstracts in this category.

24 COMPOSITE MATERIALS

Includes laminates.

N80-10317*# National Aeronautics and Space Administration, Washington, D. C.

THE SCATTER OF MECHANICAL VALUES OF CARBON FIBER COMPOSITES AND ITS CAUSES

S. Roth Sep. 1979 19 p Transl. into ENGLISH of Paper 78-196 (West Germany), 1978 20 p Presented at Symp. uber Ermudungsfestigkeit von Flugzeugen und Modernen Bauweisen, Darmstadt, West Germany, 22 Sep. 1978 Original language doc. announced as A79-20488 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Deutsche Gesellschaft fur Luft- und Raumfahrt, West Germany (Contract NASw-3198)

(NASA-TM-75698) Avail: NTIS HC A02/MF A01 CSCL 11D

The scatter of experimental data obtained in an investigation of the parameters of structural components was investigated. Strength parameters which are determined by the resin or the adhesion between fiber and resin were included. The statistical characteristics of the mechanical parameters of carbon fiber composites, and the possibilities which exist to reduce this scatter were emphasized. It is found that quality control tests of fiber and resin are important for such a reduction. J.M.S.

N80-10318*# Avco Systems Div., Wilmington, Mass.

IMPROVING THE STRESS RUPTURE AND CREEP OF SILICON NITRIDE Final Report

T. Vasilos, R. M. Cannon, Jr., and B. J. Wuensch 30 Mar. 1979 68 p refs

(Contract NAS3-20088)

(NASA-CR-159585) Avail: NTIS HC A04/MF A01 CSCL 11D

Yttria-stabilized zirconium oxide (Zyttrite) additions to purified silicon nitride markedly improved the high temperature strength, stress rupture and creep properties of hot pressed samples. Room temperature bend strengths, however, of four (4) compositions evaluated were each about one-third lower than the NC-132 silicon nitride composition. This difference decreased with increasing temperature until at 1200 C, there was reasonable equivalence between most of the zyttrite containing compositions and NC-132 in terms of short time bend strength measurements. At 1370 C, the 10 and 20 wt. % containing zyttrite compositions showed bend strengths as much as double the NC-132 material. Bend stress rupture results for 10 and 20 wt. % zyttrite containing compositions showed a strong stress sensitivity at the 176 MN/sq m (40 Kpsi) level above 1200 C. Creep in bending measurements showed that at 1370 C, zyttrite containing compositions exhibited creep rates that were about two orders of magnitude lower than NC-132 material samples. All compositions appeared to follow deformation kinetics related to a visco-elastic mechanism, i.e., glassy phase diffusional creep or grain boundary sliding. A.R.H.

N80-10319*# United Technologies Research Center, East Hartford, Conn.

DEVELOPMENT OF SILICON NITRIDE OF IMPROVED TOUGHNESS Final Report

J. J. Brennan 2 Oct. 1979 111 p refs

(Contract NAS3-21375)

(NASA-CR-159676; R79-914364-12) Avail: NTIS HC A06/MF A01 CSCL 11D

The application of reaction sintered Si2N4 energy absorbing surface layers to hot-pressed Si3N4 was investigated. The surface layer was formed by in-place nitridation of silicon powder. It was found that reaction sintered Si3N4 layers of 1 mm thickness, fabricated from either -100, +200, -200, or -325 mesh Si powder and nitrided in 96% N2/4% H2 so that approximately 20-25 vol % unnitrided Si remained in the layer, resulted in a sevenfold increase in ballistic impact resistance of a 0.64 cm thick hot-pressed Si3N4 substrate from RT 1370 C. Both NC-132 Si3N4, with MgO additive, and NCX-34 Si3N4, with Y2O3 additive, were evaluated as substrate material. The finer grain size -200 and -325 mesh nitrided Si layers were for their smoothness and relatively high density. It was found that nitriding in N2/H2 mixtures, rather than pure N2, resulted in a microstructure that did not substantially degrade the strength of the hot-pressed Si3N4 substrate. Thermal cycling tests on the RSSN/HPSN combinations from 200 C to 1370 C for 75 cycles in air did not degrade the impact resistance nor the interfacial bonding, although a large amount of internal silica formation occurred within the RSSN layer. Mach 0.8, 5 hr, hot gas erosion tests showed no surface recession of RSSN layers at 1200 C and slight surface recession at 1370 C. M.M.M.

N80-10320# Oklahoma Univ., Norman. School of Aerospace, Mechanical and Nuclear Engineering.

ANALYSES OF PLATES CONSTRUCTED OF FIBRE-REINFORCED BIMODULUS COMPOSITE MATERIALS

J. N. Reddy and C. W. Bert Jun. 1979 20 p refs

(Contract N00014-78-C-0647)

(AD-A071377; OU-AMNE-79-8; TR-2) Avail: NTIS HC A02/MF A01 CSCL 11/4

To implement the structural application of the recently introduced fiber-governed symmetric compliance model for bimodulus composite materials, both classical closed-form and finite-element solutions are being developed. This paper summarizes the results obtained for deflection of single-layer orthotropic and two-layer, cross-ply plates of the following configurations and loadings: (1) Thin elliptic plates clamped on the boundary and subjected to uniform pressure. (2) Moderately thick rectangular plate freely supported on the boundary and subjected to sinusoidally distributed pressure. GRA

N80-10321# Oklahoma Univ., Norman. School of Aerospace, Mechanical and Nuclear Engineering.

FINITE-ELEMENT ANALYSIS OF LAMINATED COMPOSITE-MATERIAL PLATES

J. N. Reddy Jun. 1979 39 p refs

(Contract N00014-78-C-0647)

(AD-A071390; OU-AMNE-79-9; TR-3) Avail: NTIS HC A03/MF A01 CSCL 11/4

A finite-element formulation of the equations governing the laminated anisotropic plate theory of Yang, Norris and Stavsky, is presented. The theory is a generalization of Mindlin's theory for isotropic plates to laminated anisotropic plates and includes shear deformation and rotary inertia effects. Finite-element solutions are presented for rectangular plates of antisymmetric angle-ply laminates having material properties that are typical of a highly anisotropic composite material. Two sets of material properties that are typical of advanced fiber-reinforced composites are used to show the parametric effects of plate aspect ratio, length-to-thickness ratio, number of layers, and lamination angle. The element is also employed to study the bending of laminated, anisotropic bimodulus material-plates. Results are presented for single-layer and two-layer cross-ply rectangular plates subjected to sinusoidal loading. The report also presents a C deg. finite element for the von Karman equations of thin elastic plates. GRA

N80-10322# Oklahoma Univ., Norman. School of Aerospace, Mechanical and Nuclear Engineering.

RECENT RESEARCH IN COMPOSITE AND SANDWICH PLATE DYNAMICS Technical Report

Charles W. Bert Jul. 1979 13 p refs

(Contract N00014-78-C-0647)

(AD-A072277; OU-AMNE-79-11) Avail: NTIS HC A01/MF A01 CSCL 20/11

This paper is a survey of literature concerning dynamics of plate-type structural elements of either composite material or sandwich construction. Papers which appeared from late 1976 through early 1979 are reviewed. Special attention is given to anisotropic plates, laminated plates, thick and sandwich plates, and nonlinearities. Free vibration and various kinds of forced vibration are treated, as well as classical and finite-element methods of analysis. GRA

N80-10323# Brookhaven National Lab., Upton, N. Y.

IMPROVEMENT OF WEAR-RESISTANCE PROPERTIES OF NATURAL AGGREGATES BY MATERIALS IMPREGNATION

Ronald P. Webster and J. J. Fontana Sep. 1978 36 p Presented at the FCP Review Conf., College Park, Md., 3 Oct. 1978

(Contract EY-76-C-02-0016)
(BNL-25396; Conf-7810178-1) Avail: NTIS HC A03/MF A01

Impregnation materials and techniques were investigated to improve the wear resistance properties of natural aggregates, thereby making them acceptable for use in pavement surfacing systems. Test results obtained during this phase of the research program are discussed. DOE

N80-10324# National Technical Information Service, Springfield, Va.
METAL MATRIX COMPOSITES. VOLUME 2: A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1974 - 1977
Mona F. Smith Jul. 1979 258 p
(NTIS/PS-79/0680/3) Avail: NTIS HC $28.00/MF $28.00 CSCL 11D

Fabrication, casting, mechanical properties, and testing of metal matrix composites including eutectic, particulate, and whisker composites are included in this report of Federally-funded research. Studies on reinforcing materials, fatigue, failure, and structure are also reported. Most of this research is applied to aircraft and spacecraft components and superconducting machinery. This updated bibliography contains 250 abstracts, none of which are new entries to the previous edition. GRA

N80-10325# National Technical Information Service, Springfield, Va.
METAL MATRIX COMPOSITES, VOLUME 3: A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1978 - Jun. 1979
William E. Reed Jul. 1979 55 p Supersedes NTIS/PS-78/0684; NTIS/PS-77/0612; NTIS/PS-76/0513; NTIS/PS-75/422; COM-74-10831
(NTIS/PS-79/0681/1; NTIS/PS-78/0684; NTIS/PS-77/0612; NTIS/PS-76/0513; NTIS/PS-75/422; COM-74-1083) Avail: NTIS HC $28.00/MF $28.00 CSCL 11D

Fabrication, casting, mechanical properties, and testing of metal matrix composites are covered along with eutectic, particulate, and whisker composites. Reinforcing materials, fatigue, failure, and structure are among the topics studied. This updated bibliography contains 57 abstracts of Federally-funded research, 39 of which are new entries to the previous edition. GRA

N80-10015 Allerton Press, Inc., New York, N. Y.
STATISTICAL OPTIMIZATION OF STRUCTURAL THERMAL PROTECTION MATERIAL THICKNESS
D. D. Nikozakov *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 57-60 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 81-84 (For primary document see N80-10001 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Ave., N.Y. 10011; $45.00

N80-10041# Allerton Press, Inc., New York, N. Y.
SELF-SIMILAR SOLUTIONS IN THE DESTRUCTION AND MELTING PROBLEM WITH ACCOUNT FOR ABRUPT DENSITY CHANGE
G. V. Druzhinin and V. G. Pavlov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 48-52 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 61-67 (For primary document see N80-10031 01-01)
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25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also 77 *Thermodynamics and Statistical Physics*.

N80-10328 Houston Univ., Tex.
FISCHER-TROPSCH SYNTHESIS OVER NICKEL CATALYSTS Ph.D. Thesis
Georghios Agamemnonos Hadjigeorghiou 1979 330 p
Avail: Univ. Microfilms Order No. 7922436

The Fischer-Tropsch synthesis of hydrocarbons over nickel catalysts was studied. Highly active and selective catalysts were developed that operated at 100% conversion, with 70% selectivity to C2-C8 hydrocarbons. The selectivity at lower conversions is reported. Steady state multiplicity that occurs under typical reaction conditions is discussed and a reactor design that does not yield multiple steady states is described. The effect of catalyst and process variables, as well as the effect of promoters, were investigated for several hundred catalysts. A mechanism for the reaction is examined and the role of the various promoters, such as transition metals, rare earths, thoria, etc., and how they affect the mechanism is discussed. Dissert. Abstr.

N80-10327 Delaware Univ., Newark.
MULTIPLE STEADY STATES OF THE OXIDATION OF CARBON MONOXIDE ON A SUPPORTED PLATINUM CATALYST Ph.D. Thesis
Brent Alan Tennant 1979 227 p
Avail: Univ. Microfilms Order No. 7921829

The oxidation of carbon monoxide was investigated in nearly isothermal single pellet differential reactors. Two steady states were observed to occur over a carbon monoxide concentration domain as large as an order of magnitude, with a maximum rate difference of rate 100 times. This concentration domain and the difference in the rates for the two steady states increased when the temperature was lowered, when the platinum loading was decreased, or when the pellet thickness was decreased. The bimolecular Langmuir-Hinshelwood kinetics with intraparticle diffusion was unable to predict the above results. The data from four pellet reactors are consistent with a kinetics which is first order at low carbon monoxide concentrations and negative order at high carbon monoxide concentrations. The kinetics is postulated to have two different rates in the region of carbon monoxide concentrations between 0.0016 and 0.014 mole fraction at 200 C and 20 percent oxygen. Dissert. Abstr.

N80-10328 *North Carolina State Univ. at Raleigh.*
A TWO-DIMENSIONAL MODEL OF THE INTERACTION OF A TRANSVERSE JET IN A SUPERSONIC STREAM WITH APPLICATION TO SUPERSONIC COMBUSTION Ph.D. Thesis
Ruben Clayton Rogers 1979 116 p
Avail: Univ. Microfilms Order No. 7923066

The ability of the present model to approximate the elliptic flow in the transverse jet region is evaluated by comparison of the predictions from the numerical calculation with experimental data. These data were obtained for the mixing and reaction downstream of a transverse hydrogen jet in a supersonic reacting flow configuration representative of a supersonic combustor. The generally favorable agreement in the trend of these data and the theoretical predictions indicate that the present model can provide the needed computational tool for the analysis and design of supersonic combustors with transverse fuel injection. Dissert. Abstr.

N80-10329# *Grumman Aerospace Corp., Bethpage, N.Y.*
THE JET MEMBRANE PROCESS FOR URANIUM SEPARATION AND ENRICHMENT
John W. Brook and Vincent Calia Sep. 1979 145 p *refs*
(RE-586) Avail: NTIS HC A07/MF A01

Isotopic enrichment of both SF6 and UF6 was successfully achieved using a scheme in which the working or carrier fluid is a condensible vapor, which can be thermally, rather than mechanically, pumped. The energy supply can be waste heat or solar energy. The process gas (UF6) is introduced into a chamber in which a heavy condensible gas (the jet) flows. Due to preferential penetration of the UF6 into the jet, the lighter species (U-235)F6 is enriched relative to the heavy species (U-238)F6. The enriched UF6 is collected by a probe facing downstream in the jet and is passed to another unit for further enrichment or to a mass spectrometer for analysis. Laboratory experiments were conducted using a variety of gas combinations to investigate system parameters that were identified as major capital and energy cost drivers. A theoretical study aided in the analysis of data and in providing scaling laws. Cost analysis, based upon the measured

UFB results and the supporting experiments, indicates that the jet membrane is a viable concept for enriching uranium industrially. A.R.H.

N80-10330*# Trenton State Coll., N. J.
ANALYTICAL MODELING OF FLASH-BACK PHENOMENA
C. C. Feng 1 Nov. 1979 17 p refs
(Grant NsG-3180)
(NASA-CR-162389) Avail: NTIS HC A02/MF A01 CSCL 21B

To understand the flame flash-back phenomena more extensively, an analytical model was formed and a numerical program was written and tested to solve the set of differential equations describing the model. Results show that under a given set of conditions flame propagates in the boundary layer on a flat plate when the free stream is at or below 1.8 m/s. J.M.S.

N80-10331# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
MEASUREMENTS OF ANOMALOUS DISPERSION OF HF IN ABSORPTION Interim Report
Rolf W. F. Gross, Richard A. Chodzko, Eugene B. Turner, and John G. Coffer 15 Jun. 1979 51 p refs
(Contract F0470-78-C-0079)
(AD-A071044; TR-0079(4764)-2; SAMSO-TR-79-44) Avail: NTIS HC A04/MF A01 CSCL 07/4

The quantitative measurement of the anomalous dispersion of the P1(6), P1(7), and P1(8) vibration-rotation transitions of hydrogen-fluoride (HF) in absorption are reported. The measurements were performed with a small, line-selectable HF laser equipped with a piezoelectrically frequency-scanned cavity that illuminated a Mach-Zehnder interferometer, one arm of which contained the HF absorption cell. The fringes produced by the interferometer and their dispersion-induced shift were observed directly with the help of a rotating mirror and an ir detector. This interferometer technique has an ultimate noise-limited sensitivity of 0.02 of a fringe spacing at 2.7 micron. Measurements also are given for the absorption coefficient at line center for the same three P1 lines of HF. Both dispersion and absorption measurements are for a pressure range of 0.05 to 10 Torr of pure HF at room temperature, so the absorption lines were Doppler broadened. The measured values for the absorption coefficient and the slope of the dispersion curve at line center and for the maximum excursion of the anomalous refractive index are in excellent agreement with calculated values for these quantities. GRA

N80-10332# Aerodyne Research, Inc., Bedford, Mass. Center for Chemical and Environmental Physics.
QUANTITATIVE SPECTROSCOPIC STUDIES OF BORON OXIDES AND FLUORIDES Final Report, 1 Apr. 1978 - 31 Mar. 1979
Michael E. Gersh and Charles E. Kolb May 1979 24 p refs
(Contract F49620-77-C-0075; AF Proj. 2303)
(AD-A070997; ARI-RR-164; AFOSR-79-0737TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

The objective of this study is the measurement of the infrared absorption coefficients and absorption line spacings of several boron compounds in the gas phase over the temperature range of 300 to 1500 K. In particular, the species of interest are BF3, BF, OBF, BO2, and HBO2. In the past year, the following technical progress was made. The high temperature flow reactor was developed to the point where it ran reliably at temperatures up to 1500 K. The optical system was tested and operated at its design specifications. The flow reactor was interfaced to the molecular beam quadrupole mass spectrometer. A prototype discharge flow system for producing the IR active species of interest was tested. Finally, the absorption coefficients of the NU-3 band of BF3 have been measured from approximately 300 to 1500 K. GRA

N80-10333# Virginia Univ., Charlottesville. Dept. of Chemistry.
LINKED AND MERCURY-BRIDGED NIDO-CARBORANES. HIGH YIELD SYNTHESIS OF MU, MU PRIME-[(CH3)2C2B4H5]2Hg, CONVERSION TO 5,5PRIME-[(CH3)2C2-B4H5]2, CLEAVAGE, AND OXIDATIVE ADDITION OF BENZENE. SYNTHESIS OF MU,MU PRIME-(B5H8)2Hg
Narayan S. Hosmane and Russell N. Grimes Jun. 1979 29 p refs Submitted for publication
(Contract N00014-75-C-0305; NR Proj. 053-569)
(AD-A070777; TR-29) Avail: NTIS HC A03/MF A01 CSCL 07/3

The nido-carborane anion (2,3-(CH3)2C2B4H5)(-) reacts readily with anhydrous HgCl2 in THF at room temperature, producing the bis(carboranyl) mercury(II) complex mu,mu'-((CH3)2C2B4H5)2Hg in which the metal is bound to two carborane ligands via B-Hg-B three-center, two-electron bridge bonds. On heating at 180 deg. in benzene, this compound quantitatively expels free mercury and forms the B-B linked nido-carborane 5,5'-((CH3)2C2B4H5)2 as a single pure isomer. Air oxidation of the linked carborane in benzene solution results in cleavage of the carborane-carborane B-B bond and oxidative addition of benzene to give 4-C6H5-2,3-(CH3)2C2B4H5, an apparently air-stable derivative of nido-2,3-C2B4H8. Similar treatment of the linked carborane in C6D6 gives the corresponding hexadeuterated carborane product. The reaction of B5H8 - ion with HgCl2 in THF produces mu,mu-(B5H8)2Hg, a stable solid in which mercury is evidently bridge-bonded to two pentaborane ligands. GRA

N80-10334# IBM Research Lab., Yorktown Heights, N. Y.
NONLINEAR SPECTROSCOPY Final Report, 1 Jan. 1972 - 31 Dec. 1977
Richard G. Brewer 7 Feb. 1978 671 p refs
(Contract N00014-72-C-0153)
(AD-A071282) Avail: NTIS HC A99/MF A01 CSCL 07/4

This research included the development of novel laser techniques which allow fundamental studies of atoms, molecules and solids, especially relaxation phenomena in the time domain. The stark and laser frequency switching techniques were examples which bring the coherence methods of pulsed NMR spin transients to the optical region. Decay time measurements on a millisecond to a picosecond timescale appeared feasible. GRA

N80-10335# Los Alamos Scientific Lab., N. Mex.
PHOTOIONIZATION MASS SPECTROMETRIC STUDIES OF SELECTED COMPOUNDS IN A MOLECULAR BEAM
Wayne Merle Trott (Sandia Labs.) Mar. 1979 240 p refs
(Contract W-7405-eng-36)
(LA-7727-T) Avail: NTIS HC A11/MF A01

Photoionization efficiency curves were measured at moderate to high resolution for several species produced in supersonic molecular beams of acetone, acetone-d6 and CS2. The molecular beam photoionization mass spectrometer which has been assembled for this work is described. The performance of this instrument was characterized by a number of experiments and calculations. DOE

N80-10336# Sandia Labs., Albuquerque, N. Mex. Surface Physics Div.
ELECTRONIC REDUCTION OF HIGH SPEED MASS SPECTRAL DATA
J. R. Lee Apr. 1979 19 p
(Contract EY-76-C-04-0789)
(SAND-79-0709) Avail: NTIS HC A02/MF A01

A window and peak height converter circuit was designed and built that extracts a single mass peak (or group of peaks) from a set of mass spectra repetitive in time and produces a time profile of that mass. The response time of the circuit is such that one has the capability of real-time operation and of operation on mass spectral data that was prerecorded on analog tape. The use of analog recording of data allows a great deal of flexibility in recording and playback speeds, and more importantly produces a permanent record of all information contained in the mass spectral data. DOE

N80-10337# Westgate Research Corp., Marina Del Rey, Calif.
INVESTIGATION INTO THE CHEMISTRY OF THE UV-OZONE PURIFICATION PROCESS Annual Report
Eriks Leitis Jan. 1979 137 p refs
(PB-296485/6; NSF/RA-790038) Avail: NTIS HC A07/MF A01 CSCL 07D

A study of the synergistic effect of ozone and UV light in the decomposition of organic compounds in water is described. Hypotheses were formulated from experiments on model organic

compounds in water solution involving ozonation with and without UV light and treatment with reagents which generate OH radicals. It was determined that ozonation and UV-ozonation of nitrobenzene, selected as a primary model compound, followed identical sequence of reactions via mono-,di-, and trihydroxylation of the benzene ring; the major stable intermediates were oxalic acid, formic acid, and glyoxal. For all oxidation systems and all model compounds, the kinetics were pseudo-first order. GRA

N80-10338# Rockwell International Corp., Creve Couer, Mo. Air Monitoring Center.

REGIONAL AIR POLLUTION STUDY. DICHOTOMOUS AEROSOL SAMPLING SYSTEM Final Report

E. Nelson Apr. 1979 50 p

(Contract EPA-68-02-2093)

(PB-297310/5; EPA-600/4-79-024) Avail: NTIS HC A04/MF A01 CSCL 14B

Ten of twenty-five stations making up the Regional Air Monitoring System (RAMS) in St. Louis were equipped with dichotomous samplers and high volume filter samplers for aerosol measurements. The dichotomous samplers were designed for automatic operation and were capable of collecting up to 36 samples in each of two size fractions before filter stacks must be changed. Sample were analyzed for determination of aerosol mass in each size fraction, as well as determination by X-ray fluorescence of the concentrations of the following elements: A, Si, P, C, K, Cr, Mn, Ga, Rb, Sr, Sn, Sb, Ba, Hg, S, Ca, Ti, V, Fe, Ni, Co, Zn, As, Se, Br, Cd, and Pb. GRA

N80-10013 Allerton Press, Inc., New York, N. Y.

ON THE FLAME STABILIZATION MECHANISM IN TWO-PHASE FUEL-AIR MIXTURE FLOW

B. G. Mingazov, V. A. Shchukin, A. V. Talantov, and I. N. Dyatlov *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 48-52 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats Tekh. (USSR), v. 21, no. 3, 1978 68-74 (For primary document see N80-10001 01-01)

Copyright. Avail: Allerton Press, Inc., 150 Fifth Ave., N.Y. 10011; $45.00

N80-10017 Allerton Press, Inc., New York, N. Y.

ANALYSIS OF FLAME STABILIZATION CONDITIONS USING THE HOMOGENEOUS REACTOR MODEL

A. V. Talantov *In its* Soviet Aeron., Vol. 21, No. 3 1979 p 66-71 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 92-99 (For primary document see N80-10001 01-01)

Copyright. Avail: Allerton Press, Inc., 150 Fifth Ave., N.Y. 10011; $45.00

N80-10074 Allerton Press, Inc., New York, N. Y.

DYNAMICS OF DIESEL FUEL COMBUSTION IN TURBULENT FLOW

F. A. Khamidullin, A. F. Kuzin, O. V. Strogonov, Yu. V. Troitskii, and A. V. Talantov *In its* Soviet Aeron., v. 22, no. 1 1979 p 58-63 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 73-80 (For primary document see N80-10061 01-01)

Copyright. Avail: Allerton Press, Inc., 150 Fifth Ave., New York, N. Y. 10011; $50.00

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N80-10339 Texas Univ. at Arlington.

THE EFFECT OF POINT CONTACT SURFACE DAMAGE ON THE WORK HARDENING OF COPPER CRYSTALS Ph.D. Thesis

Harry Michael Siegel 1979 295 p

Avail: Univ. Microfilms Order No. 7922986

The effect of various combinations of multiple point contact surface damage and subsequent thermal processing on the flow stress curves of high purity copper single crystals was investigated. Two types of changes were produced in the flow stress curves of the crystals. Samples which received a 70 hour isothermal anneal following point contact surface damage of the (1(-1)1) faces displayed an average increase of 57% over the control samples in the extent of stage 1. It is proposed that this increase in the extent of stage 1 is caused by a depletion in the number of secondary sources. Samples which were damaged on their ((-3)(-2)1) faces and received little or no annealing possessed two linear segments in stage 2 in contrast to the single linear segment observed in the other samples. Dissert. Abstr.

N80-10340 Stanford Univ., Calif.

THE DEVELOPMENT OF ALUMINUM-ALUMINUM OXIDE ALLOYS BY MECHANICAL ALLOYING Ph.D. Thesis

Paul Sandford Gilman 1979 288 p

Avail: Univ. Microfilms Order No. 7917234

Two aspects of oxide dispersion metal processing were investigated: the production of a fine homogeneous aluminum oxide distribution in aluminum via mechanical alloying and the effects of deformation processing on the subsequent recrystallization and elongated grain formation in a model oxide dispersion strengthened metal, Al-1%Si. The development of Al-Al2O3 composite powders by mechanical alloying was studied by observing the microstructural, morphological, and chemical changes that occur in the constituent powders after mechanical alloying in a high speed mill. The strengths, ductilities, and electrical conductivities of vacuum hot pressed, mechanically alloyed Al-Al2O3 alloys with and without additional thermal mechanical processing were evaluated. Dissert. Abstr.

N80-10341 Engineering Sciences Data Unit, London (England).

FATIGUE CRACK PROPAGATION IN HIGH ALLOY AND CORROSION RESISTANT (STAINLESS) STEEL PLATE, BAR AND FORGINGS

1979 33 p Also Publ. as ISSN-0141-3996 and ISSN-0141-4089

(ESDU-79003; ISBN-0-85679-250-0; ISSN-0141-3996; ISSN-0141-4089) Copyright. For information on availabity of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC $578.50

The fatigue crack propagation rate in terms of linear elastic fracture mechanics is presented. The chemical composition and mechanical properties of the materials are given. ESDU

N80-10342 Rensselaer Polytechnic Inst., Troy, N. Y.

THE EFFECT OF ENVIRONMENTAL VARIABLES ON THE STRESS CORROSION CRACKING BEHAVIOR OF TYPE 304 STAINLESS STEEL IN HIGH TEMPERATURE WATER ENVIRONMENTS Ph.D. Thesis

Peter Louis Andresen 1979 185 p

Avail: Univ. Microfilms Order No. 7922223

The metallurgical condition, chloride ion concentration, dissolved oxygen concentration, and applied potential are the variables in the tests performed. No stress corrosion cracking was observed in any of the metallurgical conditions when tested in solution containing up to 1000 ppm chloride unless dissolved oxygen was introduced or applied potentials were impressed. Straining electrode experiments indicated that the repassivation rate increases with temperature. The influence of the passive film on pitting and cracking behavior is minimal at temperatures above 220 C, which correlates with a change in film structure from p-type to n-type conductivity. The latter structure has a higher anionic vacancy concentration and therefore, transport of chloride occurs more readily. Pitting and transgranular stress corrosion cracking results are interpreted based on the adsorption of a critical amount of chloride, and its effect on dissolution and localized lattice ductility. Dissert. Abstr.

N80-10343 Florida Univ., Gainesville.

THE RELATIONSHIPS OF THE PROCESS VARIABLES AND MATERIAL PROPERTIES ON CLAD-ROLLED METALS Ph.D. Thesis

Herbert Arthur Joseph Chin 1979 548 p

Avail: Univ. Microfilms Order No. 7921918

A fundamental study of sandwich rolling was conducted. Of principal concern were: (1) the mechanics of the deformation process, (2) the development of preferred orientation, (3) the evolution of grain shape anisotropy, and (4) roll bonding of dissimilar metals. For the moderate friction conditions utilized,

the analytical models were poor predictors of the deformation process. This has been rationalized in terms of the inherent assumptions in those models. Roll bonding by multipass reduction was inferior to a single pass reduction of equal magnitude if the first pass is less than the critical reduction to initiate bonding, regardless of compact variables. Dissert. Abstr.

N80-10344*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ANALYSIS OF THE RESPONSE OF A THERMAL BARRIER COATING TO SODIUM AND VANADIUM DOPED COMBUSTION GASES

Robert A. Miller 1979 23 p refs Presented at 8th Midwest High Temperature Chemistry Conf., Milwaukee, Wis., 4-6 Jun. 1979 Sponsored in part by DOE

(Contract EF-77-A-01-2593)

(NASA-TM-79205; DOE/NASA/2593-79/7; E-090) Avail: NTIS HC A02/MF A01 CSCL 11F

Published data on the behavior of zirconia-based thermal barrier coatings exposed to combustion gases doped with sodium and vanadium were analyzed with respect to calculated condensate dew points and melting points. Coating temperatures, failure locations, and depths were reasonably well correlated. Author

N80-10345# Virginia Univ., Charlottesville. Dept. of Chemistry.

NICKEL BORON HYBRID CLUSTERS: SYNTHESIS OF POLYHEDRAL NICKELABORANES AND NICKELACARBORANES FROM SMALL BORANE AND CARBORANE ANION. CRYSTAL STRUCTURE OF (ETA5-C5H5)4Ni4B4H4

James R. Bowser, Alan Bonny, J. Robert Pipal, and Russell N. Grimes Jun. 1979 47 p refs Submitted for publication

(Contract N00014-75-C-0305)

(AD-A070926; TR-30) Avail: NTIS HC A03/MF A01 CSCL 07/3

Insertion of two to four nickel atoms into polyborane cages has been accomplished by reactions of metal reagents with the B5H8(-) and (CH3)2C2B4H5(-) ions in tetrahydrofuran followed by air oxidation. Treatment of NaB5H8 with NiBr2 and NaC5H5 generates closo-1,6-(Eta 5-C5H5)2Ni2B8H8 and closo-1,7-(Eta 5-C5H5)2Ni2B10H10, and the reaction of NaB5H8 with (Eta 5-C5H5)2Ni and sodium amalgam gives closo-(Eta 5-C5H5)4Ni4B4H4 and nido-(Eta 5-C5H5)4Ni4B5H5. Nickelocene and Na (CH3)2C2B4H5 yield closo-(Eta 5-C5H5)2Ni2(CH3)2C2B4H4 and nido-(Eta 5-C5H5)2Ni2(CH3)2C2B5H5. The new compounds were structurally characterized from their (11)B and (1)H pulse Fourier transform NMR, ir, and low-and-high-resolution mass spectra, and an X-ray crystal structure determination on (Eta 5-C5H5)4Ni4 B4H4. GRA

N80-10346# Wright State Univ., Dayton, Ohio. Dept. of Engineering

DETERMINATION OF CONSTITUTIVE EQUATIONS FOR HIGH STRENGTH ALUMINUM AND TITANIUM ALLOYS APPLICABLE TO SHEET METAL FORMABILITY Final Report, 23 Sep. 1977 - 23 Sep. 1978

Joseph F. Thomas, Jr. Apr. 1979 98 p refs Prepared in cooperation with Battelle Columbus Labs., Ohio

(Contracts F33615-77-C-5260; F33615-77-C-5059; Grant AF-AFOSR-3252-77; AF Proj. 2306)

(AD-A072121; AFML-TR-79-4042) Avail: NTIS HC A05/MF A01 CSCL 11/6

The formability of sheet metal can be investigated by the calculation of a forming limit curve (FLC) which gives the locus of principal strains beyond which failure is expected. For failure by plastic instability, the FLC depends upon material formability indices including the strain hardening coefficient and strain rate sensitivity. If a yield surface can be assumed, the material parameters needed to calculate the FLC can be obtained from uniaxial tensile data. This approach has been adopted to investigate the formability of certain high strength aerospace sheet alloys. GRA

N80-10347# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.

THE DEVELOPMENT OF AMLGUARD, A CLEAR, WATER DISPLACING, CORROSION PREVENTIVE COMPOUND Final Report

Gabriel J. Pilla 11 May 1979 69 p refs

(AD-A071617; NADC-78220-60) Avail: NTIS HC A04/MF A01 CSCL 11/6

Previous corrosion control treatment used on exposed corrodible surfaces of naval aircraft required the application of two materials a water displacing, corrosion preventive compounds, MIL- C-81309 a brown, thin film material, followed by the application of corrosion preventive compound MIL- C-16173, Grade 4 a brown, tack material. This combination provided adequate corrosion protection, but deposited a rather unsightly brown, dirt attracting film. The need to develop a compound with water displacing, corrosion preventive properties resulting in the deposit of a clear, dry, flexible film was essential. The recently developed compound AMLGUARD, designed with the above characteristics, fulfilled these objectives and performed successfully during laboratory tests and fleet evaluations. Military Specification MIL- C-85054 as Titled, Corrosion Preventive Compound, Water Displacing, Clear AMLGUARD was issued 23 March 1977. National stock numbers, 8030-01-041-1596 and 8030-01-045-4780 have been issued for the 16 ounce aerosol containers and the one quart bulk containers, respectively. GRA

N80-10348# Air Force Materials Lab., Wright-Patterson AFB, Ohio.

QUASI-STATIC CRACK GROWTH IN METALS AT ELEVATED TEMPERATURE, A REVIEW Final Report, Jun. 1977 - Sep. 1978

L. S. Fu Mar. 1979 55 p refs

(AF Proj. 2307)

(AD-A072347; AFML-TR-78-136) Avail: NTIS HC A04/MF A01 CSCL 20/11

The literature on fatigue and sustained load crack growth in metals at elevated temperature is examined within the framework of fracture mechanics. Fatigue crack growth (FCG) rates are found to be frequency dependent. A transition from transgranular to intergranular failure modes is noted as frequency decreases. The time-dependent effect on FCG rates comes from oxidation damage and creep crack growth. In extrapolating the low-cycle fatigue laboratory test data to service conditions, the interaction with creep and oxidation can drastically modify the predicted behavior. Quasi-static crack growth is observed at elevated temperature at stress intensity levels well below the materials fracture toughness. Empirical results and theoretical models for prediction of initiation and growth of cracks are critically reviewed. Results are not conclusive as to which fracture parameter should be used for prediction. Guidelines are given for further studies in this area. GRA

N80-10349# Army Construction Engineering Research Lab., Champaign, Ill.

FRACTURE CHARACTERISTICS OF STRUCTURAL STEELS, REFERENCE MANUAL Final Report

J. Aleszka, Y. Kim, J. Scott, and A. Kumar Apr. 1979 325 p refs

(AD-A072054; CERL-TR-M-258) Avail: NTIS HC A14/MF A01 CSCL 11/6

This report presents the findings of a scanning electron microscope (SEM) study of tensile, fatigue, and impact fracture characteristics of structural steels used in Army Corps of Engineers facilities and components. Steels investigated were ASTM A-36, ASTM A-514 AX-110 weld, HY-130, ASTM A-588, ASTM A-242, AISI 416, 17-4 PH, ASTM A-516, and ASTM A-607. Specimens were tested in as-received, hydrogen-embrittled, and temper-embrittled conditions. The failure mode of embrittled and unembrittled AX-110 weldments containing induced weld defects was also studied. The information contained in this reference manual will provide a basis for comparison of fracture characteristics to determine the mode of failure in analysis of components failure. Four examples of inservice failures in which the SEM provided valuable information are also presented. GRA

N80-10350# Florida Atlantic Univ., Boca Raton. Dept. of Ocean Engineering.

FATIGUE AND CORROSION FATIGUE OF HY-80 STEEL, AS APPLICABLE TO ANCHOR BOLT FAILURES Final Report

W. H. Hartt and J. J. Adamson 7 Jul. 1979 28 p refs

(Contract N00014-78-C-0307)
(AD-A072087) Avail: NTIS HC A03/MF A01 CSCL 11/6

The fatigue crack growth rate behavior of compact tension specimens of HY-80 steel have been determined for low stress intensity ranges. Tests were performed in laboratory air and sea water, both freely corroding and cathodically polarized to -0.85 volts (cu-CuSO4), and at stress ratios, R, of 0.1 and 0.8. For the lowest stress intensity ranges investigated apparent thresholds for tests in air were less than in sea water at both stress ratios. Comparison of the present results with those upon other steels of various strength levels suggests that improved fatigue crack growth resistance should result from selection of HY-80 for low stress intensity range, high mean stress intensity applications. GRA

N80-10351# Sandia Labs., Albuquerque, N. Mex.
STRESSES IN SPUTTER DEPOSITED NICKEL AND COPPER OXIDE THIN FILMS
P. V. Plunkett, R. M. Johnson (Univ. of Tex. at Arlington), and C. D. Wiseman (Univ. of Tex. at Arlington) 1979 13 p refs Presented at the Intern. Conf. on Met. Coatings, San Diego, Calif., 23 Apr. 1979
(Contract EY-76-C-04-0789)
(SAND-79-0045C; Conf-790442-2) Avail: NTIS HC A02/MF A01

The total induced stresses were determined in thin film deposited on copper substrates by sputtering. For nickel films, the stresses were determined as a function of film thickness and initial substrated temperature. For copper oxide films, stresses were determined as a function of film thickness and oxygen partial pressure during the deposition cycle. Nickel films exhibited tensile stresses in all cases; however, stresses decreased by 50% for initial substrate temperatures of 673 K compared to deposition at ambient temperatures. Copper oxide films could readily be produced in tension or compression depending on the amount of oxygen present during deposition. Both nickel and copper oxide films approached constant stress values for films thicker than approximately 0.7 micrometers. DOE

N80-10352# McElroy (Ralph) Co., Austin, Tex.
ELECTROCHEMICAL COPPER COATINGS FOR SURFACE FINISHING OF hf RESONATORS
W. D. Weiss 1979 23 p Transl. into ENGLISH of German report, "Galvanische kupferschichten zur oberlachenveredelung con hf-resonatoren" Prepared for Los Alamos Scientific Lab.
(Contract W-7405-eng-36)
(LA-TR-79-10) Avail: NTIS HC A02/MF A01

The finishing of the resonators for the UNILAC will take place in bright copper plating baths. The following demands are made of the copper coatings: (1) low surface roughness; (2) homogeneous layer (no pits or pores); (3) good conductivity (high frequency conductivity); (4) low outgas rate; (5) good adhesion; (6) uniform coating thickness distribution. The properties of the coatings which are produced from acid bright copper plating baths as a rule fulfill conditions 1, 2, 4, and 6. Because there was strong scatter in the conductivities of coatings which were deposited in baths from different producers, an attempt was made to explain the causes of this scatter through systematic bath investigations and to prepare baths from which coatings with the highest possible conductivity could be produced. DOE

N80-10353# Argonne National Lab., Ill.
MODULATED STRUCTURES IN INORGANIC ONE-DIMENSIONAL METALS
Jack M. Williams and A. J. Schultz 1979 8 p refs Presented at Intern. Conf. on Modulated Structures, Kailua-Kona, Hawaii, 22 Mar. 1979
(Contract W-31-109-eng-38)
(CONF-790341-7) Avail: NTIS HC A02/MF A01

The formation and nature of modulated structures in one-dimensional inorganic metals are discussed. Partially oxidized tetracyanoplatinate and bisoxalatoplatinate complexes comprise a class of inorganic materials known for their highly one-dimensional (1-D) electrical conductivity. Their crystal structures derive basically from linear, or nearly linear, stacks of square planar [Pt(CN)4]/sup -x/ or [Pt(C2O4)]/sup -y/ groups (x = 1.6 to 1.75, y = 1.60 to 1.65) in which overlapping Pt d/sub z/2 orbitals form a 1-D metallic band. In all cases, a characteristic feature of these 1-D metals is the existence of a modulated structure. This structural feature derives from a modulation of the average atomic positions which arises from electron-phonon coupling, and the study of this phenomena provides important insight into the underlying conduction band properties of the material. DOE

N80-10354# Oak Ridge National Lab., Tenn.
DUCTILITY IN BENDING OF MOLYBDENUM ALLOYS IRRADIATED BETWEEN 425 AND 1000C
B. L. Cox and F. W. Wiffen 1979 15 p Presented at 1st Topical Meeting on Fusion Reactor Materials, Miami Beach, Fla., 29 Jan. 1979
(Contract W-7405-eng-26)
(CONF-790125-53) Avail: NTIS HC A02/MF A01

Molybdenum and the alloys Mo-0.5% Ti and TZM were irradiated at four temperatures between 425 and 1000 C, to a displacement level of 11 dpa at a fluence of 2.5 x 10 to the 26th power n m/2 (>0.1 MeV). Vacuum bend tests at elevated temperatures showed the ductile-to-brittle transition temperature (DBTT) to be above room temperature for all irradiation temperatures. Irradiation at 585 C produced the highest DBTT, 550 to 700 C. Differences among the three materials were minor. DOE

N80-10355# Oak Ridge National Lab., Tenn.
TENSILE PROPERTIES OF TYPE 316 STAINLESS STEEL IRRADIATED IN A SIMULATED FUSION REACTOR ENVIRONMENT
M. L. Grossbeck and P. J. Maziasz 1979 5 p refs Presented at the 1st Topical Meeting on Fusion Reactor Mater., Miami Beach, Fla., 29 Jan. 1979
(Contract W-7405-eng-26)
(CONF-790125-50) Avail: NTIS HC A02/MF A01

Tensile and fracture properties of type 316 stainless steel in neutron fluences producing 16 dpa and 1000 at. ppM He resulting from irradiation in the High Flux Isotope Reactor. Tensile elongations remained above 6% at 350 and 450 C and 4% at 575 C. Fracture behavior has been examined in the 20% cold-worked material. At 350 C the fracture mode is unchanged by irradiation and is characterized by ductile tearing. At 450 C irradiation causes the fracture mode to change from ductile tearing to crystallographic fracture which may occur along the slip bands introduced by the cold working. At 575 C the fracture is changed from ductile transgranular to intergranular. The tensile properties observed are believed to be adequate for fusion reactor service within the values of damage parameters investigated. DOE

N80-10356# Brookhaven National Lab., Upton, N. Y.
HYDROGEN DIFFUSION AND TRAPPING IN bcc AND fcc METALS
D. Richter 1979 19 p refs
(Contract EY-76-C-02-0016)
(BNL-26132) Avail: NTIS HC A02/MF A01

Representative fcc and bcc metals for dilute H-solutions are surveyed. The nature of the elementary step in H-diffusion is described. Here the temperature and isotope dependence of the H-diffusion coefficient gives hints to the mechanism involved. The experimental results are discussed in terms of semiclassical and quantum mechanical diffusion theories. DOE

N80-10357# Oak Ridge National Lab., Tenn.
CREEP BEHAVIOR OF HASTELLOY X, 21/4 Cr-1 Mo STEEL, AND OTHER ALLOYS IN SIMULATED HTGR HELIUM
H. E. McCoy, Jr. Jun. 1979 58 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6822) Avail: NTIS HC A04/MF A01

Creep tests on several materials both in environments of air and in helium containing small amounts of H2, CH4, CO and H2O are reported. Tests have been run on Hastelloy X at 650 to 870 C for times to 20,000 h, and although it does carburize in helium, its creep properties are very similar in both environments. Tests have been run on 2 1/4 Cr-1 Mo steel at 482 to 650 C for times to 20,000 h, and its creep strength is less in helium than in air, likely because of the decarburization that occurs in helium. Limited creep tests have been run on 9 Cr-1 Mo steel, alloy 800H, Hastelloy S, and alloy 617. The results show no large environmental creep effects but are insufficient

to conclude that such effects do not exist. A test sample of Ni-7% Cr-12% Mo-4% Fe-2% Ti completely resisted carburization under conditions where Hastelloy X increased in carbon content from 0.0993 to 0.436%. Most of the creep tests described in this report are continuing. Samples of Hastelloy X and alloy 617 for subsequent testing are aging: one set has accumulated 17,000 h in air, and one set has accumulated 7000 h in helium. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N80-10358* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

COMPOUND OXIDIZED STYRYLPHOSPHINE Patent

Kazimiera J. L. Paciorek, inventor (to NASA) (Ultrasystems, Inc., Irvine, Calif.) Issued 18 Sep. 1979 13 p Filed 19 May 1978 Supersedes N78-25216 (16 - 16, p 2093) Division of US-Patent-Appl-SN-706424, Filed 19 Jul. 1976, US-Patent-4,092,466; sponsored by NASA

(NASA-Case-MSC-14903-2; US-Patent-4,168,287; US-Patent-Appl-SN-907435; US-Patent-Class-260-926; US-Patent-Appl-SN-706424; US-Patent-4,092,466) Avail: US Patent and Trademark Office CSCL 07C

A process is described for preparing flame resistant, nontoxic vinyl polymers which contain phosphazene groups and which do not emit any toxic or corrosive products when they are oxidatively degraded. Homopolymers, copolymers, and terpolymers of a styrene based monomer are prepared by polymerizing at least one oxidized styrylphosphine monomer from a group of organic azides, or by polymerizing p-diphenylphosphinestyrene and then oxidizing that monomer with an organoazide from the group of (C6H5)2P(O)N3, (C6H5O)2P(O)N3, (C6H5)2C3N3(N3), and C6H5C3N3(N3)2. Copolymers can also be prepared by copolymerizing styrene with at least one oxidized styrylphosphine monomer. Official Gazette of the U.S. Patent and Trademark Office

N80-10359 Rochester Univ., N. Y.

CREEP AND RECOVERY OF AMORPHOUS POLYMERS Ph.D. Thesis

Randy Wu Tung 1979 176 p

Avail: Univ. Microfilms Order No. 7922968

Creep and recovery phenomena of amorphous polymers are investigated. A correlation between the two phenomena from the viewpoint of thermally activated rate processes is examined. The temperature change method was employed to obtain the temperature dependence of creep rate. The creep behavior for polycarbonate was studied in the temperature range of 323 to 420 K and stress range of 4 to 45 MN/sq m. The activation enthalpy for the creep process was in the range of 40 to 180 Kcal/mole. The temperature and stress ranges under which creep was studied for PMMA was 303 to 378 K and 2 to 35 MN/sq m respectively. Values ranging from 27 to 108 Kcal/mole were obtained for the activation enthalpies. Dissert. Abstr.

N80-10360 Washington State Univ., Pullman.

ELECTROPOLYMERIZATION IN STATIONARY CELLS AND IN PACKED AND FLUIDIZED BED ELECTRODE CELLS Ph.D. Thesis

Edward Fon San Teng 1979 165 p

Avail: Univ. Microfilms Order No. 7923517

Metal surfaces were polymer coated through electropolymerization in stationary and fluidized bed electrode cells. The polymer yield was a function of current density, time, monomer concentration, electrode material, electrolyte, and fluidization condition. In the stationary cell, the rate of polymerization based on a free radical mechanism was a function of monomer concentration and an initiation efficiency parameter dependent on the hydrogen overvoltage of the cathode material. It was postulated that the depostion rate was initially controlled by chemical reaction and that subsequently, both pore diffusion and chemical reaction were controlling steps. In the fluidized bed, both chemical reaction and mass transfer seemed to control the amount of polymer formed at low flow rates, while only chemical reaction was controlling at high flow rates. Dissert. Abstr.

N80-10361*# National Aeronautics and Space Administration. Pasadena Office, Calif.

MOLTEN SALT PYROLYSIS OF LATEX Patent Application

Albert J. Bauman, inventor (to NASA) (JPL) Filed 27 Apr. 1978 11 p Sponsored by NASA

(NASA-Case-NPO-14315-1; US-Patent-Appl-SN-900659) Avail: NTIS HC A02/MF A01 CSCL 07C

The production of synthetic hydrocarbon liquid fuel from latex rich plants is reported. The pyrolysis of high isoprene latex plants such as Guayule, or extracts thereof, in a molten inorganic salt at temperatures above 300 C is described. The pyrolysis process is examined using a number of inorganic salts and a reactor is described for the hydrogen fuel production. A.W.H.

N80-10362# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.

THE RELATIONSHIP BETWEEN EXCITATION INTENSITY AND PHOTOCHROMIC GLASS KINETICS

Herbert D. Kivlighn and Richard Delasi Sep. 1979 20 p refs (PM-892) Avail: NTIS HC A02/MF A01

Two model photochromic glasses were prepared. Each glass contains silver chloride as the photolytic species, but one of the compositions also contains copper as a catalyst. The response of these glasses to excitation levels up to 108 mw/squared cm in the 0.3-0.4 micrometer band was investigated. The effect of glass heat treatment and excitation intensity on the steady state degree of darkening and on the darkening and fading rates are described. Author

N80-10363# Princeton Univ., N. J. Dept. of Chemical Engineering.

INVESTIGATION OF THE T SUB LL (>T SUB G) RELAXATION OF HOMOPOLYMERS AND BLOCK COPOLYMERS OF STYRENE BY TORSIONAL BRAID ANALYSIS Progress Report, Jun. 1977 - Jun. 1979

J. K. Gillham Jul. 1979 36 p

(Contract N00014-76-C-0200; NR Proj. 356-504)

(AD-A072075; TR-17) Avail: NTIS HC A03/MF A01 CSCL 07/4

Investigation of the T (II) (= Tlgl) relaxation in amorphous polymers of styrene by the technique of torsional braid analysis is reviewed. For the most part the relaxation behaves like the glass transition in its dependence on molecular weight, on average molecular weight in binary polystyrene blends, and on composition in a polystyrene homogeneously plasticized throughout the range of composition. Diblock and triblock copolymers also display a T = Tlg) relaxation above the Tlg) of the polystyrene phase. Unlike the glass transition, the T(II) relaxation appears to depend on the nature of the substrate. Two results in particular suggest that the T(II) relaxation is molecularly based. (1) The T(II) temperature is determined by the number average molecular weight for binary blends of polystyrene when both components have molecular weights below Mlc) (the critical molecular weight for chain entanglements). (2) Homopolymers, and diblock and triblock copolymers of styrene, have a T = Tlg) relaxation at approximately the same temperature when the molecular weight of the styrene block is equal to that of the homopolymer. GRA

N80-10364# Illinois Univ. at Urbana-Champaign. Dept. of Chemistry.

PREPARATION AND CHARACTERIZATION OF POLYMER-BOUND POLYDENTATE AMINES Interim Report

Russell S. Drago and John H. Gaul 10 Jul. 1979 9 p refs Submitted for publication

(Contract N00014-78-C-0245)

(AD-A071150; ONR-TR-2) Avail: NTIS HC A02/MF A01 CSCL 07/3

Synthetic procedures for attaching multidentate amines to organic polymers are described. These materials form the basis for the preparation of wide variety of macrocyclic and chelating ligands that can be covalently attached to polymers. The reaction to produce Schiff base chelates is described and a series of covalently attached metal complexes prepared and identified.

These systems have potential as catalysts for organic oxidations. GRA

N80-10365# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
THERMOGRAVIMETRIC ANALYSIS OF POLYMERS IN AIR Final Report, Nov. 1977 - Feb. 1978
Gerhard F. L. Ehlers and Edward J. Solodki Aug. 1978 116 p (AF Proj. 2419)
(AD-A070689; AFML-TR-78-64) Avail: NTIS HC A06/MF A01 CSCL 07/3

This report is concerned with the weight loss curves of 107 polymers, representative of a wide range of systems such as aliphatic, fluoroaliphatic, aromatic, heterocyclic and semiorganic, are presented. The data have been obtained in a DuPont 951 Thermogravimetric Analyzer in air at a heating rate of 20 deg. C/min. GRA

N80-10366# Pittsburgh Univ., Pa. Dept. of Metallurgical and Materials Engineering.
FLAMMABILITY AND THERMAL STABILITY OF POLYPHOSPHAZENES COPOLYMERS, PART 1 Interim Report
S. V. Peddada and J. H. Magill 19 Jul. 1979 41 p refs
(AD-A072114; SETES-MME-79-39; TR-2) Avail: NTIS HC A03/MF A01 CSCL 07/3

Flame spread and thermal stability measurements have been made on filled and unfilled poly(fluoroalkoxyphosphazenes) (PNF sheet) and poly(aryloxyphosphazene) (APN sheet and foam materials). The PNF samples were also filled with silica or carbon black and the APN with aluminum trihydrate. Burn velocity measurements were made under steady state conditions in a vertically downward burning mode at different oxygen/nitrogen concentrations. The effect of sample thickness on burn rate was also studied for the foam specimens. Relative smoke density measurements were made using a photocell assembly, and limiting oxygen index (L.O.I) determinations were carried out in accordance with standard ASTM procedures. Thermal stabilities were measured in air and nitrogen using a Perkin Elmer TGS-2 apparatus at heating rates varying from 2.5 to 80 C min. A temperature span of 50 to 650 C was covered in both thermogravimetric and differential thermogravimetric measurements. Activation energies for degradation were determined from these data. The effect of fillers on thermal stability and flammability characteristics were determined. Glass transition temperature were also measured as an aid to polymer characterization. GRA

N80-10367# Union Carbide Corp., Tarrytown, N.Y. Chemicals and Plastics Div.
FLUORODINITRO SILICON COMPOUNDS AND HIGH ENERGY ELASTOMERIC POLYMERS Final Report, 1 Apr. 1975 - 30 Apr. 1979
Robert S. Neale 31 May 1979 154 p
(Contract N00014-75-C-0791)
(AD-A072559) Avail: NTIS HC A08/MF A01 CSCL 19/1

High energy (HE) orgnosilane esters were prepared from 2, 2, 2-fluorodinitroethanol (ROH) and chlorosilanes in 85-90% yields. Physical property, shock sensitivity, and multinuclear NMR data are reported for the monomeric silanes (RO)(x)SiMe(4-x)(X = 2-4) and the disiloxane Me(RO)2SiOSi(OR) 2Me, along with calculated heat contents and detonation properties. A general hydrolytic sensitivity was observed which increased regularly with the number of RO- groups per Si. Overall, the physical and thermochemical properties of the trisester (RO)3SiMe most closely resembled those of the reference plasticizer FEFO, except for a desirably higher bp. Aminoalkyl (methyl) polysiloxane homopolymers were prepared by hydrolysis of the dialkoxysilanes (R(1)O) 2MeSi-Z-NH2, with R(1) = Et or Me and Z = CH2, (CH2)3, (CH2)3NHCH2CH2, or (CH2)4, and analyzed by Si29 NMR. The products could be varied to contain up to approx. 85% linear siloxy units, with the balance as mainly 4 and 5 unit cycles. GRA

N80-10368# Queen Mary Coll., London (England).
FRACTURE MECHANICS OF INELASTIC POLYMERS Final Technical Report, 11 Apr. 1975 - 1 Oct. 1978
E. H. Andrews Apr. 1979 20 p refs
(Grant DA-ERO-75-G-049)
(AD-A072615) Avail: NTIS HC A02/MF A01 CSCL 11/9

The author's Generalized Theory of Fracture Mechanics has been applied to several quite different polymeric materials which have in common a nonlinear and inelastic deformation behavior. Thus, the normal Linear Elastic Fracture Mechanics cannot be applied. When applied to experimental data the theory provides a unique characterization of fracture resistance and also sheds light on the molecular or microscopic fracture mechanisms of the material concerned. GRA

N80-10369# General Electric Co., Schenectady, N. Y.
INVESTIGATION OF MICROTUBULAR CERAMIC STRUCTURES Final Report, 1 Jul. 1978 - Jan. 1979
Robert L. Fulman Feb. 1979 96 p refs
(Contract N00014-76-C-1047)
(AD-A072144; SRD-79-018) Avail: NTIS HC A05/MF A01 CSCL 11/2

Calculations and experiments were conducted to explore the feasibility of producing very compact high-temperature heat exchangers via microtubular ceramic structures. Such microtubular ceramic structures consist of multiple interconnected ceramic tubes with very thin walls, small diameters, and modest ratios of length to diameter. As a result, they should have reasonable strength, as well as very high specific area. The investigation included: calculations of expected volume requirements and heat-exchange performance for microtubular ceramic heat exchangers compared to one of conventional dimensions; experiments seeking to define means for preparing leak-tight microtubular ceramic structures; preliminary exploration of means to provide separate manifolds to the interior and exterior of the microtubes; and a leak test of one experimental manifold microtubular ceramic structure. GRA

N80-10370# Sandia Labs., Albuquerque, N. Mex.
MORPHOLOGY OF RUBBER MODIFIED EPOXY ENCAPSULANTS
J. A. Sayre 1979 12 p refs Presented at US/UK Symp. on Neutron Generators, Albuquerque, N. M., 21 May 1979
(Contract EY-76-C-04-0789)
(SAND-79-0158C; Conf-790518-5) Avail: NTIS HC A02/MF A01

Examination of rubber modified epoxy, cured with diethanol amine, via the transmission electron microscope has shown that a broad distribution of rubber particle sizes exists. The average particle size for particles greater than .1 um was found to be .8 um. A significant population of particles was found whose diameters are less than .1 um. Examination of the particle interface showed that the interface between the dispersed phase and the epoxy matrix was sharp within the accuracy of the method used. The morphology observed was compared against morphologies which have been purported to result in toughening via shear banding and crazing. It was found that the observed particle size distribution did not preclude toughening by these mechanisms. DOE

N80-10371# National Bureau of Standards, Washington, D. C. Structures and Materials Div.
STUDIES ON THE PHOTODEGRADATION OF POLY (METHYL METHACRYLATE) Final Report
Mohamed Abouelezz and P. F. Waters Jun. 1979 53 p refs
Prepared in cooperation with American Univ., Washington, D. C.
(PB-297793/2; NBSIR-79-1766) Avail: NTIS HC A04/MF A01 CSCL 11I

The effect of the radiation from the upper part of the ultraviolet, UV, and the visible regions on poly methyl methacrylate (PMMA) was studied. The mechanism(s) of degradation induced by the radiation were identified. Thin films of PMMA were irradiated in air with upper UV, upper UV-visible, upper UV-visible-near infrared and 436 and 546 nm radiation. Exposure to either the upper UV or visible radiation caused degradation of the polymer. The data show that both random scission and unzipping of the polymer chain are operative in the degradation. Unzipping becomes increasingly important with incident radiation of increasing wavelength. GRA

N80-10372# National Bureau of Standards, Washington, D. C. Polymer Science and Standards Div.
MODELS FOR THE MIGRATION OF PARAFFINIC ADDI-

TIVES IN POLYETHYLENE Annual Report, 1 Oct. 1977 - 30 Sep. 1978
L. E. Smith, I. C. Sanchez, S. S. Chang, and F. L. McCrackin
Jan. 1979 102 p refs Sponsored in part by Food and Drug Administration
(PB-297671/0; NBSIR-79-1598) Avail: NTIS HC A06/MF A01 CSCL 11I

Using a modified equation of state approach, models were developed for estimating the equilibrium partitioning of a diffusant in a polymer at a temperature above its glass transition in contact with a finite volume of solvent. Some possible new approaches to a diffusion theory based on volume fluctuations were outlined. Model calculations using diffusion equations were made for the extraction of additives from polymers with concomitant solvent absorption and for finding a constant extraction temperature equivalent to migration under varying temperature conditions. The migration of an oligomer, 14C-labeled octadecane, from high density linear polyethylene into various solvents at different temperatures was measured in order to elucidate the effects of thickness, temperature, concentration, and solvent. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.

N80-10373 Colorado Univ. at Boulder.
TRANSIENT PHENOMENA IN THERMAL EXPLOSION OF CONFINED GASES Ph.D. Thesis
Justin Harold Poland 1979 205 p
Avail: Univ. Microfilms Order No. 7923273

The thermal explosion of a combustible mixture of gases in a vessel is treated first as a transient heat conduction problem and second as a gasdynamics problem. Both the transient heat conduction problem and the gasdynamic problem are found to have the same basic three stage pattern of development. Perturbation methods are used to simplify the full field equations and to isolate the dominant physical phenomena at each stage in the development of the explosion. Approximate analytical solutions to the resulting equations are obtained wherever possible, and numerical solutions are obtained otherwise. Dissert. Abstr.

N80-10374* National Aeronautics and Space Administration. Pasadena Office, Calif.
START UP SYSTEM FOR HYDROGEN GENERATOR USED WITH AN INTERNAL COMBUSTION ENGINE Patent
John Houseman (JPL) and Donald J. Cerini, inventors (to NASA) (JPL) Issued 5 Jul. 1977 13 p Filed 22 Mar. 1976 Sponsored by NASA
(NASA-Case-NPO-13849-1; NASA-Case-NPO-13907-1; US-Patent-4,033,133; US-Patent-Appl-SN-668783; US-Patent-Class-60-606; US-Patent-Class-23-288R; US-Patent-Class-48-61; US-Patent-Class-48-102A; US-Patent-Class-48-10-3; US-Patent-Class-48-107; US-Patent-Class-48-117; US-Patent-Class-48-DIG.8; US-Patent-Class-60-300; US-Patent-Class-123-3; US-Patent-Class-123-179R; US-Patent-Class-123-DIG.12; US-Patent-Class-423-650) Avail: US Patent and Trademark Office CSCL 21D

A hydrogen generator provides hydrogen rich product gases which are mixed with the fuel being supplied to an internal combustion engine for the purpose of enabling a very lean mixture of that fuel to be used, whereby nitrous oxides emitted by the engine are minimized. The hydrogen generator contains a catalyst which must be heated to a pre-determined temperature before it can react properly. To simplify the process of heating up the catalyst at start-up time, either some of the energy produced by the engine such as engine exhaust gas, or electrical energy produced by the engine, or the engine exhaust gas may be used to heat up air which is then used to heat the catalyst.
Official Gazette of the U.S. Patent and Trademark Office

N80-10375 Pennsylvania State Univ., University Park.
FUELS BY ALGAE HYDROGENATION Ph.D. Thesis
Lih-yen Chin 1979 143 p
Avail: Univ. Microfilms Order No. 7922274

A hydrogenation process which permitted the conversion of algae (Chlorella pyrenoidosa) to liquid products was developed and studied. The algae hydrogenation was carried out in a batch autoclave at high temperatures and operating pressures in the presence of a catalyst and a solvent. High yields of oil were achieved over a wide range of process conditions and useful ammonium carbonates and hydrocarbon-rich gases were also produced as by-products. A procedure was developed to characterize and analyze algae-derived products. Generally, algae-derived products can be divided into six categories: algae oil, asphaltene, benzeneinsolubles, water, ammonium carbonates, and gases. Temperature-programmed gas chromatography was useful for analyzing the algae oil fractions. A clay percolation method was of value in separating algae oils into hydrocarbons and polar compounds. Asphaltene was characterized by means of gel permeation chromatography. The composition of gases was determined by gas chromatography. Dissert. Abstr.

N80-10376 Missouri Univ. -Rolla.
THE BIOLOGICAL CONVERSION OF CORN RESIDUE INTO ETHYL ALCOHOL USING AN IMMOBILIZED-CELL REACTOR Ph.D. Thesis
Oliver Clifford Sitton 1979 158 p
Avail: Univ. Microfilms Order No. 7921536

Saccharomyces cerevisiae was immobilized to a fixed support in order to achieve an ethanol productivity from sugars that was up to nine times the maximum productivity achieved in a conventional, stirred tank reactor. Dilution rates up to six times the washout rate in a stirred tank reactor were obtained. Using hydrolyzed corn residue as a glucose source reduced maximum ethyl alcohol productivity from 1.75g/l-hour to 1 g/l-hour in the stirred tank reactor. However, when using hydrolyzate material in the immobilized cell column the productivity was only slightly reduced. Glucose concentrations of 30 g/l and 60 g/l and residence times of 4.1, 2.4 and 1.3 hours were tested in the immobilized cell reactor. A plug flow first order reaction model described the data in these tests and allowed calculations of apparent rate constants. Dissert. Abstr.

N80-10377*# National Aeronautics and Space Administration. Pasadena Office, Calif.
CONTINUOUS COAL PROCESSING METHOD AND MEANS Patent Application
Porter R. Ryason, inventor (to NASA) (JPL) Filed 28 Sep. 1976 31 p Sponsored by NASA
(NASA-Case-NPO-13758-2; US-Patent-Appl-SN-727444) Avail: NTIS HC A03/MF A01 CSCL 21D

A coal pump is provided in which solid coal is heated in the barrel of an extruder under pressure to a temperature at which the coal assumes plastic properties. The coal is continuously extruded, without static zones, using, for example, screw extrusion preferably without venting through a reduced diameter die to form a dispersed spray. The dispersed coal may be continuously injected into vessels or combustors at any pressure up to the maximum pressure developed in the extrusion device. The coal may be premixed with other materials such as desulfurization aids or reducible metal ores so that reactions occur, during or after conversion to its plastic state. Alternatively, the coal may be processed and caused to react after extrusion, through the die, with liquid oxidizers, whereby a coal reactor is provided. Alternative utilization of the device may be to secure continuous pyrolysis of the coal or to feed the extruded coal into furnaces operating at pressures near ambient. NASA

N80-10378*# Aerojet Liquid Rocket Co., Sacramento, Calif.
PHOTOGRAPHIC COMBUSTION CHARACTERIZATION OF LOX/HYDROCARBON TYPE PROPELLANTS
D. Craig Judd 27 Jul. 1979 84 p refs
(NASA-CR-160318; DMT-113T-1) Avail: NTIS HC A05/MF A01 CSCL 21I

Single element injectors and two fuels were tested with the aim of photographically characterizing observed combustion phenomena. The three injectors tested were the O-F-O triplet, the transverse like on like (TLOL), and the rectangular unlike doublet (RUD). The fuels tested were RP-1 and propane. The hot firings were conducted in a specifically constructed chamber

fitted with quartz windows for photographically viewing the impingement spray field. All LOX/HC testing demonstrated coking with the RP-1 fuel leaving far more soot than the propane fuel. No fuel freezing or popping was experienced under the test conditions evaluated. Carbon particle emission and combustion light brilliance increased with Pc for both fuels although RP-1 was far more energetic in this respect. The RSS phenomena appear to be present in the high Pc tests as evidenced by striations in the spray pattern and by separate fuel rich and oxidizer rich areas. The RUD element was also tested as a fuel rich gas generator element by switching the propellant circuits. Excessive sooting occurred at this low mixture ratio (0.55), precluding photographic data. J.M.S.

N80-10379*# BDM Corp., McLean, Va.
COAL CONVERSION PROCESSES AND ANALYSIS METHODOLOGIES FOR SYNTHETIC FUELS PRODUCTION Final Report
5 Oct. 1979 285 p refs
(Contract NASB-33608)
(NASA-CR-161322; BDM/W-79-548-TR) Avail: NTIS HC A13/MF A01 CSCL 21D

Information to identify viable coal gasification and utilization technologies is presented. Analysis capabilities required to support design and implementation of coal based synthetic fuels complexes are identified. The potential market in the Southeast United States for coal based synthetic fuels is investigated. A requirements analysis to identify the types of modeling and analysis capabilities required to conduct and monitor coal gasification project designs is discussed. Models and methodologies to satisfy these requirements are identified and evaluated, and recommendations are developed. Requirements for development of technology and data needed to improve gasification feasibility and economies are examined. A.W.H.

N80-10380# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
X-RAY SPECTROSCOPY AS A DIAGNOSTIC TOOL IN SOLID PROPELLANT COMBUSTION FLOWS Technical Report, Feb. 1977 - Feb. 1978
W. K. McGregor May 1979 49 p refs
(AF Proj. 2308)
(AD-A070796; AFRPL-TR-78-61) Avail: NTIS HC A03/MF A01 CSCL 21/2

X-ray spectroscopy offers a potential method for the measurement of composition, elemental density, and particle mass in the gas/particle flows of solid propellant rockets. A theoretical analysis was performed from which it was concluded that both transmittance and fluorescence measurements in the 1 to 10 keV photon energy range will yield elemental densities of Al and Cl and transmittance can possibly give O, N and C densities, although sensitivity for the latter three elements to transmittance is poor. The sensitivity of the K(alpha) fluorescence measurement to Al and Cl density changes is much greater than the sensitivity of transmittance measurements. However, the latter are required in order to determine densities directly from fluorescence rates. Hence, a combined transmittance and fluorescence measurement system is warranted. An investigation of commercially available hardware indicated that adequate detection systems exist, but insufficient data on photon flux rates from typical X-ray generating tubes was available to assess the adequacy of X-ray beam sources. Recommendations for proof-of-principle experiments are made, and a rocket test scenario is described for application to solution of the two-phase flow loss problem in solid propellant rockets. GRA

N80-10381# Los Alamos Scientific Lab., N. Mex.
STORAGE STABILITY OF KRATON-BONDED HMX-BASED EXPLOSIVES
E. D. Loughran and H. L. Flaugh 1978 20 p Presented at 6th DOE Compatibility Meeting, Golden, Colo., 17 Oct. 1978
(Contract W-7405-eng-36)
(LA-UR-78-2720; Conf-781067-2) Avail: NTIS HC A02/MF A01

Pressed pieces of X-0287 and X-0298 were stored for various time intervals at oven temperatures ranging from 40 C to 90 C. Amount of evolved gas, polymer molecular weight changes, and tensile property differencies were used to assess the storage stability of the explosives. After one yr in open containers at 60 C, the molecular weight of the Kraton polymer in X-0287 decreased by 15% to 30% and the tensile strength dropped correspondingly. However, no significant change in these properties was observed for X-0298 pieces stored at the same temperature for one yr in sealed containers. Gas evolution from small cylinders of X-0298 stored at 90 C in sealed glass ampoules for 68 weeks amounted to only 2 cu cm/g, and was due mainly to HMX decomposition. No significant change in polymer molecular weight was observed. It is concluded that X-0298 is exceptionally stable when stored under the conditions of this test. DOE

N80-10382# Battelle Pacific Northwest Labs., Richland, Wash.
ASSESSMENT OF SYNFUEL TRANSPORTATION TO YEAR 2000
W. Wakamiya, K. B. Sebelien, and M. A. Parkhurst Mar. 1979 113 p refs
(Contract EY-76-C-06-1830)
(PNL-2768) Avail: NTIS HC A06/MF A01

The potential problems in the transportation of synthetic fuels (synfuels) are discussed and identified. The emergence of transportation-related problems in shale oil and coal synfuel development expected to be highly dependent upon their chemical similitude with analagous fossil fuels. Definitive resolution of the question of whether new transportation problems exist is dependent upon clear characterization of the synfuels chemical composition. Hydrogen and methanol represent unique cases since these materials are already in commercial production. The major transportation problem identified with fuel economics based on these materials is related to bulk use. To date, shipment volumes are relatively small and, in the case of hydrogen, can be accommodated with costly, more specialized packaging. Scale-up for major energy use may introduce a new set of transportation problems. DOE

N80-10383# Escher Technology Associates, St. Johns, Mich.
SURVEY OF LIQUID HYDROGEN CONTAINER TECHNIQUES FOR HIGHWAY VEHICLE FUEL SYSTEM APPLICATIONS
W. J. D. Escher Nov. 1978 66 p refs
(Contract EC-77-X-01-2752)
(HCP/M2752-01) Avail: NTIS HC A04/MF A01

The design and operational features of four different liquid hydrogen container types, three of which have served operationally as vehicle fuel tanks, and rough production-lot cost estimates for a nominal 50 gallon horizontal cylindrical liquid hydrogen container applicable to vehicle service are reported. A unique semiautomatic liquid hydrogen service station developed in Germany is described. A general assessment of the state of technology of vehicle hydrogen containers and associated systems is given, including the identification of pacing items recommended to be addressed initially in prospective R and D activities in this field. DOE

N80-10384# Sandia Labs., Livermore, Calif.
APPLICATIONS ANALYSIS OF FIXED SITE HYDROGEN STORAGE
J. J. Iannucci and S. L. Robinson May 1979 23 p refs
(Contract EY-76-C-04-0789)
(SAND-78-8272) Avail: NTIS HC A02/MF A01

The potential applications and requirements for fixed site storage in a scenario of wide spread hydrogen use are examined and quantified. An envisioned hydrogen production/distribution/end-use cycle is scrutinized to identify the storage needs for both continuous and intermittent sources including solar. The most pressing need for storage is at the distribution point, in concurrence with current natural gas practice. Caverns and similar underground storage techniques are the most promising modes due to their low cost relative to all other options examined. Since a large volume of natural gas storage is presently in service, a pressing need to develop fixed site hydrogen storage technology (beyond the conversion of this underground storage to hydrogen) was not identified. DOE

N80-10385# California Univ., Livermore. Lawrence Livermore Lab.
MODELING OF FLAME PROPERTIES OF METHANOL

Charles K. Westbrook and Frederick L. Dryer Mar. 1979 12 p refs Presented at the Alcohol Fuels Technol. 3d Intern. Symp., Monterey, Calif., 28-31 May 1979
(Contract W-7405-eng-48)
(UCRL-82434; Conf-790620) Avail: NTIS HC A02/MF A01

Computational flame modeling, using a recently developed chemical kinetic mechanism for methanol oxidation, provides a means of obtaining much data on the structure and propagation of methanol flames. The effects of stoichiometry, pressure, unburned gas temperature, and trace constituents, such as water vapor on flame speed and flammability, are determined and discussed. In each distinct physical regime, different elementary reactions tend to dominate the reaction mechanism, and in each case the interactions between fluid mechanical and chemical kinetic processes are responsible for the observed behavior. DOE

N80-10386# Department of Energy, Morgantown, W. Va. Energy Technology Center.
FLUIDIZED-BED COMBUSTION OF HIGH SULFUR COALS
J. S. Mei, J. S. Halow, U. Grimm, and R. L. Rice Apr. 1979 149 p refs
(METC/RI-79/4) Avail: NTIS HC A07/MF A01

The sulfur retention capability of an atmospheric fluidized-bed combustor (AFBC) burning a high sulfur coal was evaluated in light of the EPA proposed New Source Performance Standards and their potential impact on AFBC technology. A high volatile bituminous Pittswick coal with 4.52 percent sulfur content was selected and Greer limestone and Tymochtee dolomite were used as sulfur sorbents. Combustion tests were carried out at various operating conditions to develop AFBC engineering and emissions data on this high sulfur coal. Ninety or greater percent of sulfur retention was attained in 9 of the 19 balance periods. Eighty-five or greater percent sulfur retention was attained in 14 of the 19 balance periods. Results demonstrate that the proposed new standards for sulfur dioxide emissions can be met by AFBC's. DOE

N80-10387# TRW Energy Systems Planning Div., McLean, Va.
METHANE RECOVERY FROM COALBEDS Annual Report, Dec. 1977 - Dec. 1978
1978 29 p
(Contract DE-AC21-78MC-08089)
(DOE/MC-08089-T1) Avail: NTIS HC A03/MF A01

Work done in the engineering and integration effort in the Morgantown Energy Technology Center program to recover and utilize methane from coalbeds is summarized. The contract requirements and approach are outlined. The work accomplished includes the development of the Unminable Drilling Plan, performance of testing and data analysis for wells into coal seams, development of three conceptual recovery and utilization designs. Milestone and expenditure charts are provided. DOE

N80-10388# Mobil Research and Development Corp., Princeton, N. J.
RESEARCH GUIDANCE STUDIES TO ASSESS GASOLINE FROM COAL BY METHANOL-TO-GASOLINE AND SASOL-TYPE FISCHER-TROPSCH TECHNOLOGIES Final Report
Max Schreiner Aug. 1978 324 p refs
(FE-2447-13) Avail: NTIS HC A14/MF A01

A technical and economic comparison between the new Mobil methanol-to-gasoline technology under development and the commercially available Fischer-Tropsch technology for the production of motor gasoline meeting U.S. quality standards is presented. Except for the Mobil process, processes used are commercially available. Coproduction of products, namely SNG, LPG and gasoline, is practiced. Four sensitivity cases were also developed in less detail from the two base cases. In all areas, the Mobil technology is superior to Fischer-Tropsch: process complexity, energy usage, thermal efficiency, gasoline selectivity, gasoline quality, investment and gasoline selectivity, investment and gasoline cost. Principal advantages of the Mobil process are its selective yield of excellent quality gasoline with minimum ancillary processing. DOE

N80-10389# Mitre Corp., McLean, Va.
NEAR TERM POTENTIAL OF WOOD AS A FUEL
Jan. 1979 71 p refs
(Contract EG-77-C-01-4101)
(HCP/C4101) Avail: NTIS HC A04/MF A01

The sources of wood as a fuel are cited. Technologies available to expand the near-term use of wood fuel include direct combustion, low-Btu gasification in the presence of air, pyrolysis to char, liquid fuel, and low-Btu gas in the absence of air, and densification. Life-Cycle costs were evaluated for these technologies. Incentives in increase the use of wood fuel in the near term are identified. Systems manufactures, architecture and engineering firms, and users are listed. DOE

N80-10390# Institute of Gas Technology, Chicago, Ill.
DEVELOPMENT OF COMBUSTION DATA TO UTILIZE LOW BTU GASES AS INDUSTRIAL PROCESS FUELS. PROJECT 61004 SPECIAL REPORT NO. 4: HIGH-FORWARD-MOMENTUM BURNER
R. T. Waibel and E. S. Fleming Nov. 1978 42 p refs
(Contract EX-76-C-01-2489)
(FE-2489-33) Avail: NTIS HC A03/MF A01

Data were gathered to determine the performance of a high-forward-momentum burner when retrofit with three low-to-medium-Btu gases. The burner was fired on the IGT pilot-scale test furnace with a load simulating one zone of a continuous refractory kiln or one instant during the heat-up of a batch kiln. The low- and medium-Btu gases simulated for these combustion trials were Koppers-Totzek oxygen, Wellman-Galusha air, and Winkler air fuel gases. All of the substitute fuels exhibited stable flames when directly retrofit on the burner. Koppers-Totzek oxygen gave a thermal efficiency slightly greater than that for natural gas, but Wellman-Galusha and Winkler air fuel gases each had lower efficiencies. Koppers-Totzek oxygen and Wellman-Galusha air fuel gases had flame lengths longer than that for natural gas, whereas Winkler air fuel gas had a flame length comparable to the natural gas flame. DOE

N80-10391# Institute of Gas Technology, Chicago, Ill.
DEVELOPMENT OF GAS TURBINE FUELS AND COMBUSTION: AN OVERVIEW
A. A. Fejer 1979 12 p refs Presented at New Fuels and Advances in Combustion Technologies, New Orleans, 26-30 Mar. 1979
(Contract EX-76-C-01-2433)
(CONF-790337-4) Avail: NTIS HC A02/MF A01

The characteristic features of gas turbine engines are described contrasting them with their chief competitor, the steam cycle. The focus is on the aerodynamic processes in the combustion chambers of traditional engines and includes an outline of the changes that are to be expected with the introduction of the synthetic and coal derived fuels. DOE

N80-10392# Institute of Gas Technology, Chicago, Ill.
COAL CONVERSION SYSTEMS: TECHNICAL DATA BOOK
1978 585 p
(Contract EX-76-C-01-2286)
(HCP/T2286-01; LC-78-606163; TP759.C52) Avail: NTIS HC A25/MF A01

Technical information necessary for the design and operation of coal conversion facilities is provided. Such facilities include the conversion of coal to environmentally acceptable fuel forms, or to electric power by way of advanced technologies. Physical, chemical, thermodynamic data, and correlations are included along with procedures necessary to develop a new process or to design, build, and operate a coal conversion plant. DOE

N80-10393# Mitre Corp., McLean, Va. METREK Div.
BIOMASS-BASED ALCOHOL FUELS: THE NEAR-TERM POTENTIAL FOR USE WITH GASOLINE
W. Park, G. Price, and D. J. Salo Aug. 1978 84 p refs
(Contract EG-77-C-01-4101)
(HCP/T4101-03) Avail: NTIS HC A05/MF A01

The requirements and prospects for a nationwide alcohol-gasoline fuel system based on alcohols derived from biomass resources are assessed. Technological and economic factors of the production and use of biomass-based methanol and ethanol fuels are evaluated relative to achieving 5 or 10 percent alcohol-gasoline blends by 1990. It is concluded the maximum attainable is a nationwide 5 percent methanol or ethanol-gasoline

system replacing gasoline by 1990. Relative to existing gasoline systems, costs of alcohol-gasoline systems will be substantial. DOE

N80-10394# Mitre Corp., McLean, Va.
DESIGN OF A PILOT SILVICULTURAL BIOMASS FARM AT THE SAVANNAH RIVER PLANT
D. J. Salo, F. F. Henry, and R. E. Inman Mar. 1979 132 p refs
(Contract EG-77-C-01-4101)
(HCP/T4101-01) Avail: NTIS HC A07/MF A01
A detailed plan for the establishment and operation of the farm at the Savannah River Plant, Aiken, South Carolina includes a discussion of possible sites, layout and design, and installation and operation. The estimated costs of installation and operation are also presented. DOE

N80-10395# Battelle Columbus Labs., Ohio.
SUGAR CROPS AS A SOURCE OF FUELS. VOLUME 1: AGRICULTURAL RESEARCH Final Report
E. S. Lipinsky, S. Kresovich, T. A. McClure, D. R. Jackson, W. T. Lawhon, A. A. Kayloncu, and E. L. Daniels 31 Jul. 1978 222 p refs
(Contract W-7405-eng-92)
(TID-29400/1) Avail: NTIS HC A10/MF A01
Narrow-row spacing experiments were conducted. They promote more rapid canopy closure which helps a short season location more than a long season location. Sweet sorghum experiments indicate favorable yields compared with sugarcane, and yield increases with close spacing in all areas. The project team concludes that sweet sorghum has considerable fuel potential, based on its ability to grow wherever corn or soybeans grow. Initial evaluation of the Tilby cane separator process, which separates the pith from the rind fiber without crushing and grinding, indicates that the process is promising as a means of obtaining fermentable sugars at low cost. The advantages of the Tilby process are low energy consumption, high value for the rind fiber coproducts in products that perform like plywood, pulp or paper making, and ability to use high fiber sugarcane or sweet sorghum. DOE

N80-10396# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.
BIOMASS ENERGY ENHANCEMENT: A REPORT TO THE PRESIDENT'S COUNCIL ON ENVIRONMENTAL QUALITY Final Report
Michael Jerry Antal, Jr. Jul. 1978 140 p refs
(Contract EG9AD499; Grant EPA-R-804836)
(PB-296624/0) Avail: NTIS HC A07/MF A01 CSCL 21D
The technical and economic potential for enhancing the energy value of biomass is examined and the feasibility of using solar heat to gasify biomass is developed. With improved technology, this would permit the energy carried by the synthetic fuel leaving the conversion facility to exceed or equal the biomass fuel input. The potential impact of biomass energy enhancement technologies is examined in a case study for New Jersey. The outcome is favorable for solar heat. GRA

N80-10397# New Mexico Univ., Albuquerque. Technology Application Center.
HYDROGEN AS A FUEL. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Progress Report, 1977 - Jul. 1979
Gerald F. Zollars Aug. 1979 24 p Sponsored in part by NTIS
(NTIS/PS-79/0771/0) Avail: NTIS HC $28.00/MF $28.00 CSCL 21D
The 219 citations concern the use of hydrogen as a fuel for aircraft and automobiles. Topics covered include storage, fuel combustion studies, gas mixtures, and energy conversion efficiency. GRA

N80-10398# Wisconsin Univ. Center System, Rice Lake.
ENERGY AND ECONOMIC ASSESSMENT OF ANAEROBIC DIGESTERS AND BIOFUELS FOR RURAL WASTE MANAGEMENT Final Report
Tom P. Abeles, David Freedman, Laura A. DeBaere, and David A. Ellsworth Dec. 1978 176 p refs
(Grant EPA-R-804457)
(PB-296523/4; EPA-600/7-78-174) Avail: NTIS HC A09/MF A01 CSCL 21D
A technological and socioeconomic assessment of anaerobic digester feasibility for small to midsize livestock operations was undertaken. Three full scale digesters and one pilot scale facility were under various degrees of monitoring and evaluation to assess design and operational problems as they affect the adoption and establishment of farm scale anaerobic digestors. Materials handling presented the greatest obstacle to satisfactory operation of the full scale systems. The system becomes more economical if the biogas can be used on site for direct thermal loads, suggesting that the economic feasibility of anaerobic digesters is site specific and should be closely integrated with the total farming operation. GRA

N80-10399# Tracor Jitco, Inc., Rockville, Md.
A SAFETY PRACTICES MANUAL FOR THE MANUFACTURING, TRANSPORTATION, STORAGE, AND USE OF PYROTECHNICS
Joanna M. Fringer, James B. Willis, Sally W. Snyder, and Pamela H. Errico 1979 194 p refs
(Contract DHEW-210-77-0145)
(PB-297807/0) Avail: NTIS HC A09/MF A01 CSCL 19A
A compilation of existing regulations, consensus standards, and professional recommendations for the protection of persons involved in the manufacture, transport, storage, use, and field mixing of pyrotechnics is presented. GRA

N80-10400# Economics, Statistics and Cooperatives Service, Washington, D. C. Natural Resource Economics Div.
GROWING ENERGY: LAND FOR BIOMASS FARMS Final Report
Kathryn A. Zeimetz Jun. 1979 41 p refs
(PB-296650/5; AER-425) Avail: NTIS HC A03/MF A01 CSCL 21D
The utilization of high quality land to maximize energy gain and minimize environmental hazards are considered. It was concluded that alternate sources of food and fiber production must be allocated as some lands are diverted to energy farms. GRA

N80-10401# New Mexico Univ., Albuquerque. Technology Application Center.
HYDROGEN PRODUCTION. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Report, 1977 - Jul. 1979
Gerald F. Zollars Springfield, Va. NTIS Aug. 1979 45 p Sponsored by NTIS
(NTIS/PS-79/0773/6) Avail: NTIS HC $28.00/MF $28.00 CSCL 21D
This bibliography cites 169 articles from the international literature concerning hydrogen production. Techniques examined include solar energy conversion, coal gasification, thermal dissociation, and water electrolysis. GRA

N80-10402# New Mexico Univ., Albuquerque. Technology Application Center.
HYDROGEN STORAGE AS A HYDRIDE. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Report, 1975 - Jul. 1979
Gerald F. Zollars Springfield, Va. NTIS Aug. 1979 29 p Sponsored by NTIS
(NTIS/PS-79/0772/8) Avail: NTIS HC $28.00/MF $28.00 CSCL 21D
Articles from the international literature concerning the storage of hydrogen in various metal hydrides are cited. Binary and intermetallic hydrides are considered. Specific alloys discussed are iron-titanium, lanthanum-nickel, magnesium-copper, and magnesium-nickel among others. This bibliography contains 97 entries. GRA

N80-10008 Allerton Press, Inc., New York, N. Y.
ON THE QUESTION OF SELECTING THE CHARACTERISTIC QUANTITY GOVERNING FUEL SELF-IGNITION IN A STREAM
V. N. Gruzdev, N. A. Malishevskaya, and M. D. Tauger *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 28-30 refs Transl.

into ENGLISH from Izv. Vyssh. Uchebn. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 42-45 (For primary document see N80-10001 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Ave., N.Y. 10011; $45.00

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N80-10403 California Inst. of Tech., Pasadena.
LEADING EDGE FLUTTER OF A SUPERCAVITATING HYDROFOIL Ph.D. Thesis
Kiam Thian Ooy 1979 149 p
Avail: Univ. Microfilms Order No. 7922053

Flat plate hydrofoils were tested for leading edge flutter. The phenomenon is considered a complex function of speed, angle of attack, cavitation number and mass ratio. Leading edge flutter was observed to cause cavity pinching. Two mathematical models are presented. The first one models the flexible chord foil as a rigid chord foil hinged at the trailing edge; the second model treats the fluid structure interaction problem of a flexible chord foil cantilevered at the trailing edge. Dissert. Abstr.

N80-10404# Army Construction Engineering Research Lab., Champaign, Ill.
THE BUILDING LOADS ANALYSIS AND SYSTEM THERMODYNAMICS BLAST PROGRAM. VERSION 2.0: USERS MANUAL, VOLUME 2 Final Report
Douglas C. Hittle Jun. 1979 166 p ref Supersedes CERL-TR-E-119-Vol-1
(AD-A072273; CERL-TR-E-153-Vol-2) Avail: NTIS
HC A08/MF A01 CSCL 09/2

The Building Loads Analysis and System Thermodynamics (BLAST) program is a comprehensive set of subprograms for predicting energy consumption in buildings. There are three major subprograms: (1) the space load predicting subprogram, which computes hourly space loads in a building or zone based on user input and hourly weather data; (2) the air distribution system simulation subprogram, which uses the computed space load and user inputs describing the building air-handling system to calculate hot water or steam, chilled water, and electric demands; and (3) the central plant simulation program, which simulates boilers, chillers, onsite power generating equipment and solar energy systems and computes monthly and annual fuel and electrical power consumption and plant life cycle cost. GRA

N80-10405# National Bureau of Standards, Washington, D. C.
DIMENSIONS/NBS. VOLUME 63, NUMBER 3, MARCH 1979
Mar. 1979 33 p refs
(PB-296733/9; NBS-DIM-63-3) Avail: NTIS
HC A03/MF A01 CSCL 14B

Technical developments are highlighted, NBS publications are listed, and major statements by NBS management are summarized. Topics featured include: (1) microwave measurements on snow packs; (2) measurement services for ultrasonic nondestructive evaluation; (3) national load standard revisions; (4) X-ray image magnetification; (5) evaluating pipeline welds; and (6) determination of molybdenum ion spectrum. K.L.

N80-10406# National Bureau of Standards, Washington, D. C.
THE CALIBRATION OF A ROUNDNESS STANDARD Final Report
Charles P. Reeve Jun. 1979 23 p refs
(PB-297708/0; NBSIR-79-1758) Avail: NTIS
HC A02/MF A01 CSCL 14B

For the past decade the National Bureau of Standards has been making high precision roundness measurements using an algorithm which allows the spindle out-of-roundness to be separated from the true profile of the workpiece. The algorithm requires multiple traces on a roundness measuring instrument, and the resulting redundancy provides an estimate of the measurement precision. The mathematical model used for this measurement process is described. Some related topics are discussed briefly and an example is given. GRA

N80-10407# National Bureau of Standards, Washington, D. C. Office of Engineering Standards.
STANDARDS SYSTEM IN CANADA, THE UK, WEST GERMANY, AND DENMARK: AN OVERVIEW Final Report
David Hemenway Apr. 1979 196 p refs
(PB-296912/9; NBS/GCR-79/172) Avail: NTIS
HC A05/MF A01 CSCL 14A

The subjects discussed are: (1) history; (2) organization and finances; (3) standards development; (4) certification and accreditation; (5) international standards work; (6) consumer and labor participation; (7) metric conversion; (8) antitrust aspects; (9) research into economic impacts; (10) the government's use of standards and its role in standards work; and (11) other activities. GRA

N80-10408# Mathematical Sciences Northwest, Inc., Bellevue, Wash.
THERMAL AND LIGHTING EFFICIENCY STANDARDS Final Report
7 Dec. 1978 196 p refs Revised Sponsored by Washington State Energy Office
(PB-297429/3; MSNW-78-3043-2-R-2) Avail: NTIS
HC A09/MF A01 CSCL 13M

An energy code is recommended for new building construction that meets or exceeds the intent of ASHRAE 90-75, a national consensus standard for energy conservation adopted by the American Society of Heating, Refrigeration and Air Conditioning Engineers. Four building prototypes in three Washington locations were studied to determine energy savings and cost-effectiveness for different construction standards. It was shown that the proposed standards do indeed save energy, and that they are economically justified and in some cases can result in lower initial costs. A rough estimate of state-wide cumulative savings is nearly 65 trillion Btu's for the period 1979 through 1985 if the proposed code is enacted. This savings is equivalent to 11.15 million barrels of oil or 18.95 billion kilowatt-hours. GRA

N80-10016 Allerton Press, Inc., New York, N. Y.
ANALYTIC DESIGN OF COMPLEX SYSTEMS. II
T. K. Sirazetdinov and A. I. Bogomolov *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 61-65 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 85-91 (For primary document see N80-10001 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Ave., N.Y. 10011; $45.00

N80-10056 Allerton Press, Inc., New York, N. Y.
SPECTRAL ANALYSIS OF SURFACE IRREGULARITIES AND VIBRATIONS OF 'SPID' SYSTEM ELEMENTS DURING BURNISHING OPERATIONS
A. A. Naryshkin and D. A. Zhuravlev *In its* Soviet Aeron., v. 21, no. 4, 1978 p 120-123 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 147-150 (For primary document see N80-10031 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Avenue, New York, N. Y. 10011; $45.00

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N80-10409 California Univ., Los Angeles.
ERROR CONTROL SYSTEMS FOR MULTI-ACCESS COMMUNICATION CHANNELS Ph.D. Thesis
Billy Hitoshi Seeki 1979 294 p
Avail: Univ. Microfilms Order No. 7921453

Error control systems for multiaccess communication channels

are investigated. Error detection and retransmission techniques, which are integrated with basic channel access control disciplines are discussed. The channel access disciplines which coordinate the transmissions by the distributed stations of the communication network to avoid simultaneous transmissions over the shared channel are examined. Performance indices such as channel throughput and message delay are analyzed through a queueing theoretic approach for network stations. A stationary transmission error process model is developed to evaluate the operation of the channel under random noise errors. Dissert. Abstr.

N80-10410 Columbia Univ. Teachers Coll., New York.
SATELLITE DIRECT BROADCASTING: THE PROSPECTS FOR DEVELOPMENT Ph.D. Thesis
Richard Denny Taylor 1978 570 p
Avail: Univ. Microfilms Order No. 7810900

The issues which accompany the development of broadcasting programs directly from artificial satellites to individual television receivers is discussed. The technical, legal, political, social and economic considerations relevant to satellite direct television broadcasting are examined. The historical development is reviewed, the present situation is summarized, and observations regarding probable future developments are made.Dissert. Abstr.

N80-10411 California Univ., Los Angeles.
COMMUNICATION NETWORK SYNCHRONIZATION IN THE PRESENCE OF NOISE Ph.D. Thesis
Gilbert Lieberman 1979 531 p
Avail: Univ. Microfilms Order No. 7921434

The effects of noise and systematic error on the analysis and design of communication network synchronization systems is discussed. The emphasis is on the analytical prediction of system performance using realistic models of clock instabilities, propagation delay variability and communication channel noises. Applications to Time-Division Multiplexing (TDM), Time-Division Multiple Access (TDMA) and to phase-noise prediction in satellite communications are described. Dissert. Abstr.

N80-10412 Houston Univ., Tex.
ELECTROMAGNETIC FIELDS OF UNDERGROUND ANTENNAS Ph.D. Thesis
Faramarz Vaziri 1979 174 p
Avail: Univ. Microfilms Order No. 7922437

A formulation of the components of the electric and magnetic fields due to infinitestimal source dipoles, electric or magnetic, vertical or horizontal, situated in one of the two arbitrary general media is presented. The field components in both media are expressed in terms of single integrals with branch cuts and poles clearly defined in all cases. Numerical techniques are developed to evaluate the complex field integrals for a wide range of parameters. The relative merits of the four types of source dipoles are studied for media with different electromagnetic properties and at different frequencies. The proper choice of the source dipole is suggested for a broad range of applications in subsurface communications. Field patterns of the buried antenna are presented with the receiver being above the earth. The relative strengths of the electric field components, measured as functions of the radial distance from the source and compared with the theoretical results are discussed. Dissert. Abstr.

N80-10413*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SELF-CALIBRATING THRESHOLD DETECTOR Patent Application
James Richard Barnes (TRW Systems Group, Redondo Beach, Calif.) and Marshall Yu Huang, inventors (to NASA) (TRW Systems Group, Redondo Beach, Calif.) Filed 27 Jul. 1979 16 p Sponsored by NASA
(NASA-Case-MSC-16370-1; US-Patent-Appl-SN-061556) Avail: NTIS HC A02/MF A01 CSCL 17B

A self calibrating threshold detector for use with receivers is described. The threshold detector is adapted to receive an incoming transmitted signal carrying a prescribed code. The detector comprises a single demodulating channel which includes a mixer having one input receiving the incoming signal and another input receiving a local replica code. The detector relates generally to signal detecting systems and more particularly to receivers employing an auxiliary detector for detecting the arrival of an expected transmitted signal by correlating the phase of a local phase coded signal, produced by a local replica generator, with the phase of the transmitted signal. A.W.H.

N80-10414# Grumman Aerospace Corp., Bethpage, N.Y. System Sciences.
MINIMUM COST TRANSMITTER-RECEIVER ANTENNA PAIRS
G. Moyer and H. Hinz Sep. 1979 26 p refs
(RM-690) Avail: NTIS HC A03/MF A01

There are two types of solutions when applying the optimal control theory to antenna design. The cost (C) is an arbitrary function of the radii of the receiver (R sub 0) and of the transmitter (R sub 1). When the received power (W sub 0) divided by the area is small, as happens in the proposed satellite solar power station (SSPS), the value of the power density at the center of the receiver should be left open. Then the problem simplifies to such an extent that it can be solved with considerable accuracy using only ordinary calculus and graphs provided. The product (R sub 0) (R sub 1) depends only on the power ratio (W sub 0) (W sub 1) and can be obtained from a graph. The radius of the transmitter can then be replaced in the cost function and the best value of the radius of the receiver can be found from dC/d (R sub 0) = 0. The transmitter and receiver power density distributions are proportional and resemble a truncated Gaussian distribution. As W sub 0/sq pi (R sub 0) becomes larger the power density at the center of the receiver reaches its upper limit. After this point the problem must be solved with an additional state variable and constraint using a computer program. Numerical results are presented for the SSPS. A.R.H.

N80-10415*# TRW, Inc., Redondo Beach, Calif. Space Systems Div.
THE 30/20 GHz MIXED USER ARCHITECTURE DEVELOPMENT STUDY Final Report
Oct. 1979 216 p refs
(Contract NAS3-21933)
(NASA-CR-159686) Avail: NTIS HC A10/MF A01 CSCL 17B

A mixed-user system is described which provides cost-effective communications services to a wide range of user terminal classes, ranging from one or two voice channel support in a direct-to-user mode, to multiple 500 mbps trunking channel support. Advanced satellite capabilities are utilized to minimize the cost of small terminals. In a system with thousands of small terminals, this approach results in minimum system cost. Author

N80-10416*# TRW, Inc., Redondo Beach, Calif. Space Systems Div.
THE 30/20 GHz MIXED USER ARCHITECTURE DEVELOPMENT STUDY: EXECUTIVE SUMMARY
Sep. 1979 24 p
(Contract NAS3-21933)
(NASA-CR-159687) Avail: NTIS HC A02/MF A01 CSCL 17B

The baseline 30/30 GHz satellite communication system, designed for cost-effective communications in the years 1990 to 2000, incorporates on-board satellite demodulation and routing of individual 64 kbps digital voice-grade circuits. This level of routing flexibility is necessary to provide efficient communications to the large number of direct-to-user terminals (DTU) projected. The circuit interfacing hardware is distributed among all the DTU and master control stations. The switching circuitry which provides full interconnectivity between 30 to 45 thousand circuits is in the satellite. The DTU terminal cost, perhaps the largest element in the system cost, represents the largest economic value element of the system because it avoids using terrestrial signal distribution and routing and the charges associated with these functions. Satellite baseline design and power requirements for the system are examined. A.R.H.

N80-10417# Lincoln Lab., Mass. Inst. of Tech., Lexington.
QUASI-THREE-DIMENSIONAL DISPLAY OF INFRARED RADAR IMAGES USING RANGE/INTENSITY COLOR MAPPING
Robert C. Harvey, James S. Martin, and Dorothy R. Sullivan 6 Dec. 1978 32 p refs
(Contract F19628-78-C-0002; AF Proj. 649L)

(AD-A070671; TN-1978-44; ESD-TR-78-362) Avail: NTIS HC A03/MF A01 CSCL 05/8

By mapping range information into different hues and intensity information into different apparent brightness levels of each hue *on a color display, a three-dimensional quality can be imparted to infrared radar images. A computer algorithm for implement*ing this range/intensity color mapping is described and several *infrared radar images demonstrating the technique are presented. Possible improvements to the current algorithm and areas requiring* additional study are also discussed. GRA

N80-10418# Michigan Univ., Ann Arbor. Radiation Lab.

THEORY OF DIELECTRIC-FILLED EDGE-SLOT ANTENNAS ***Final Report, 1 Jun. 1977 - 31 May 1979***

Dipak L. Sengupta and Luis F. Martins-Camelo Jun. 1979 11 p refs

(Grant DAAG29-77-G-0152)

(AD-A071843; ARO-14808.2-EL) Avail: NTIS HC A02/MF A01 CSCL 09/5

A theory has been developed for the performance of a DFES antenna mounted on a conducting cylinder. It explains accurately the experimental results, furnished by HDL, for basic, two-element, *and single ring DFES antennas, containing an arbitrary number* of tuning posts. For such antennas, detailed computations have been carried out for arbitrary variations of the relavant parameters *of the DFES antenna. These results will clearly be of help in* the future design of this type of antenna allowing a choice of *parameters to be made beforehand in order to achieve a desired* frequency response. For DFES antennas having more than two elements or one ring, the theory breaks down when the total *number of tuning posts used exceeds some value dependent on* the radius of the antenna and when the innermost ring of posts is placed too close to the exciting post. For such antennas, *more thorough analysis is needed, involving higher order modes* and terms which have been neglected in the present theory. GRA

N80-10419# Stanford Univ., Calif. Information Systems Lab.

RESEARCH ON ADAPTIVE ANTENNA TECHNIQUES 2 Final Report

Bernard Widrow, R. Chestek, and T. Saxe 14 Mar. 1978 78 p refs

(Contract N00019-77-C-0194)

(AD-A071338) Avail: NTIS HC A05/MF A01 CSCL 17/4

The concept of adaptive power separation for single channel applications based on the 'leaky' LMS algorithm has now been extended for adaptive array applications. A new algorithm *designated as "scheme 6A" has been shown to be potentially* highly effective for nulling strong jamming signals in an aircraft receiving environment. The new scheme is substantially less *noisy and more simple to implement than "scheme 6" which* was analysed during our previous year's effort. All real-time adaptive processes experience noise in the adaptive parameters. *The amount of noise depends on the nature of the adaptive* algorithm, on the number of parameters, and on the speed of *convergence. A fundamental study of parameter noise and its* effects on the output signal has been undertaken for stochastic and deterministic inputs to weight-controlled adaptive filters driven *by the leaky LMS algorithm. Weight noise has been determined* for the case of an input consisting of a sinusoidal signal plus white noise, for wide ranges of SNR and frequency relative to *Nyquist. Broad operating regions have been found where the* output power due to weight noise is less than 5% of the output signal power. GRA

N80-10420# Ohio State Univ., Columbus. Electroscience Lab.

SWEPT FREQUENCY SCATTERING MEASUREMENTS OF AIRCRAFT

K. A. Shubert and D. L. Moffatt May 1979 127 p refs

(Contract F19628-77-C-0125; AF Proj. 2305)

(AD-A071474; RADC-TR-79-110) Avail: NTIS *HC A07/MF A01 CSCL 20/14*

Measured swept frequency complex scattering data are presented for six 1/72 scale models of aircraft and one model *of a typical pencil or aerospace vehicle-type target with various* vertical stabilizer and simple cavity attachments. The measured data span the modal frequency bands 2.2 to 4.0 GHz and/or 4.0 to 7.6 GHz. The measured data are predominantly for vertical polarization (perpendicular to a horizontal plane containing *the wings and fuselage of the aircraft) at selected sparse aspects.* The measurement system, which utilizes somewhat unique background subtraction techniques, has a bistatic angle of either *30 degrees (most targets) or eight degrees (a few pencil-type* target orientations). Synthetic pulse response waveforms (only *pulse envelopes are shown) are generated from the measured spectral data. Features of both the spectral and temporal responses* are used to extrapolate the potential of substructure target features such as tail stabilizers and cavities in prediction-correlation type identification schemes. GRA

N80-10421# Columbia Univ., New York. Radiation Lab.

RESEARCH INVESTIGATION DIRECTED TOWARD EXTENDING THE USEFUL RANGE OF THE ELECTROMAGNETIC SPECTRUM ***Progress Report, 1 Apr. 1978 - 31 Mar. 1979***

George W. Flynn 31 Mar. 1979 145 p refs

(Contract DAAG29-77-C-0019)

(AD-A071664; PR-29) Avail: NTIS HC A07/MF A01 CSCL 05/1

Contents: Relaxation and Energy Transfer in Alkali Metals; Relaxation and Energy Transfer in Small Polyatomic Molecules; Generation and Control of Radiation; Quantum Detection and *Sensing of Radiation; Physical Properties and Effects of Electronic* Materials. GRA

N80-10422# California Univ., Los Angeles. School of Engineering and Applied Science.

THE DESIGN OF AN OPTIMAL OBSERVER FOR LINEAR DISCRETE TIME DYNAMICAL SYSTEMS Final Report, May 1977 - May 1978

L. M. Novak and C. T. Leondes Jul. 1978 112 p refs

(Contract F33615-77-C-3013; AF Proj. 2307)

(AD-A072066; AFFDL-TR-78-86) Avail: NTIS *HC A06/MF A01 CSCL 17/9*

This report investigates the idea of utilizing Luenberger's minimal-order observer as an alternate to the Kalman filter for *obtaining state estimates in linear discrete time stochastic systems.* More specifically, this dissertation presents a solution to the problem of construction as optimal minimal order observer for *linear discrete time stochastic systems where optimality is in* the mean square sense. The approach taken in this report leads *to a completely unified theory for the design of optimal* minimal-order observers and is applicable to both time-varying and time-invariant linear systems. To illustrate the theory and *application of the observer designs developed in the dissertation,* the problem of designing a radar tracking system is considered. Examples are included which illustrate clearly the practicality *and usefulness of the proposed optimal observer design technique.* Finally, a host of topics for future research is presented in the hope of stimulating further research in the domain of observer *theory.* GRA

N80-10423# Stanford Univ., Calif.

COMPUTER CALCULATIONS OF TRAVELING-WAVE PERIODIC STRUCTURE PROPERTIES

G. A. Loew, R. H. Miller, R. A. Early, and K. L. Bane Mar. 1979 4 p refs Presented at the IEEE Particle Accelerator Conf., San Francisco, 12-14 Mar. 1979

(Contract EY-76-C-03-0515)

(SLAC-PUB-2295; Conf-790327-123) Avail: NTIS HC A02/MF A01

The conversion of standing waves to traveling waves is accomplished using the SUPERFISH program. The ambiguities between the properties of these two types of waves is described. *Good agreement is found between calculated results and values* obtained earlier. DOE

N80-10424# California Univ., Berkeley. Lawrence Berkeley Lab. Earth Sciences Div.

ELECTROMAGNETIC SCATTERING BY A TWO-DIMENSIONAL INHOMOGENEITY DUE TO AN OSCILLATING MEGNETIC DIPOLE Ph.D. Thesis

K. H. Lee Sep. 1978 89 p refs

(Contract W-7405-eng-48)

(LBL-8275) Avail: NTIS HC A05/MF A01

A numerical method of computing the electromagnetic response of two dimensional earth models to an oscillating magnetic dipole is presented. The generalized electromagnetic variational integral was reduced to a sum of two dimensional variational integrals by Fourier transformation. Discretization of each two dimensional integral was carried out in terms of the secondary electric fields by using the finite element method. After inversely Fourier transforming the secondary electric and magnetic fields, the total fields are finally obtained by adding the analytically calculated primary fields. The quality of the solution for the horizontal magnetic dipole is found to be relatively poor compared to that for the vertical magnetic dipole. As an alternative the solutions for two dimensional models were compared to those for some elongated three dimensional models whose cross sections correspond to the two dimensional models. DOE

N80-10248*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PROJECTED STATE-OF-THE-ART FOR FREQUENCY STANDARDS FOR THE DSN IN THE 1982 - 1990 TIME FRAME
W. Higa and R. Sydnor *In its* The Deep Space Network 15 Oct. 1979 p 54-61 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 17B

N80-10251*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
FREQUENCY DOWN-CONVERTERS AS APPLIED TO VLBI
N. C. Ham *In its* The Deep Space Network 15 Oct. 1979 p 74-82 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 20N

N80-10252*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE NOCC RADIO SCIENCE SUBSYSTEM: SYSTEM PERFORMANCE VALIDATION FOR THE DSN RADIO SCIENCE AND VERY LONG BASELINE INTERFEROMETRY (VLBI) SYSTEMS
A. L. Berman *In its* The Deep Space Network 15 Oct. 1979 p 83-92 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 17B

N80-10253*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DESIGN OF A QUICK-LOOK DECODER FOR THE DSN (7,1/2) CONVOLUTIONAL CODE
C. A. Greenhall and R. L. Miller *In its* The Deep Space Network 15 Oct. 1979 p 93-101 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 17B

N80-10255*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DSN TRACKING SYSTEM UPLINK FREQUENCY CONTROL
G. L. Spradlin *In its* The Deep Space Network 15 Oct. 1979 p 108-112 (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 17B

N80-10258*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
RADIO FREQUENCY PERFORMANCE OF DSS 14 64-m ANTENNA AT X-BAND USING A DUAL HYBRID MODE FEED
A. J. Freiley *In its* The Deep Space Network 15 Oct. 1979 p 132-140 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 20N

N80-10259*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
AN EXPERIMENTAL INVESTIGATION OF THE EFFECTS OF ANTENNA POINTING ERRORS ON RANGE DELAYS
T. Y. Otoshi and T. H. Taylor *In its* The Deep Space Network 15 Oct. 1979 p 141-147 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 20N

N80-10264*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
X-BAND SAMPLING BY THE OCCULTATION DATA ASSEMBLY
R. B. Roth *In its* The Deep Space Network 15 Oct. 1979 p 176-179 (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 20N

N80-10755# Joint Publications Research Service, Arlington, Va.
POSSIBILITY OF USING BONE CONDUCTION IN AVIATION RADIO COMMUNICATION
E. V. Lapayev, V. S. Kuznetsov, G. I. Tarasenko, and M. I. Katalov *In its USSR Report: Space Biol. and Aerospace Med.*, Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 19-25 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 14-19 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

N80-10756# Joint Publications Research Service, Arlington, Va.
SPEECH ILLUSIONS AND SIGNIFICANCE THEREOF TO AEROSPACE PRACTICE
I. Shults and M. Moravek *In its USSR Report: Space Biol.* and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 26-29 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 19-21 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also 60 Computer Operations and Hardware and 76 Solid-State Physics.

N80-10425 Houston Univ., Tex.
DESIGN AND EVALUATION OF DECENTRALIZED FILTERS FOR LARGE SCALE INTERCONNECTED SYSTEMS Ph.D. Thesis
Robert Yu-Soung Ling 1979 117 p
Avail: Univ. Microfilms Order No. 7922246

The design decentralized filters for large scale interconnected systems is considered. Decentralized filters, two different information patterns, are evaluated using matrix maximum principle. Two filters having specific structures which allow information exchange to occur over noisy channels are studied. An approximate aggregation method for obtaining approximate reduced order representation for the interaction processes of large scale interconnected systems is introduced. A filter which trades off some of the performance for a lower filter order is designed using the interaction model and its performance is evaluated. The algorithms are illustrated via an application to dynamic state estimation for multiarea power system models. Dissert. Abstr.

N80-10426 California Univ., Los Angeles.
A THEORY AND AN ALGORITHM FOR ANALOG CIRCUIT FAULT DIAGNOSIS Ph.D. Thesis
Nasrollah Navid 1979 169 p
Avail: Univ. Microfilms Order No. 7921442

Conditions are presented such that the value of each of the network elements studied is uniquely determinable from the network's behavior as seen from its external terminals. It is shown how one can determine--considering only the topology of the network--whether or not it is possible to compute the element values of a resistive network from the test terminal measurements, before going through the process of actually attempting to solve for element values. This provides guidance in selecting the optimal location, and minimum number, of test terminals. The implications of the results are extended to networks containing solid-state devices such as diodes, bipolar transistors and field-effect transistors. An algorithm for the actual computation of the element values is proposed and its global convergence is proved. Dissert. Abstr.

N80-10427 California Univ., Los Angeles.
THEORY, ANALYSIS, AND DESIGN OF A NEW TYPE OF STRIP-FED SLOT ARRAY Ph.D. Thesis
Pyong Kiel Park 1979 71 p

Avail: Univ. Microfilms Order No. 7921444

An analytical design method for a linear slot array fed by a boxed stripline is developed. The modified residue calculus technique is used to derive the electromagnetic field configuration in the boxed stripline. The geometric theory of diffraction is used to calculate the external mutual coupling of the slot elements. A novel method is used to constrain resonant slot lengths to practical values. An array of collinear slots on the center line of a boxed stripline wall was constructed to test the theory. The array test results were in close agreement with the prediction.
Dissert. Abstr.

N80-10428 University of South Florida, Tampa.
THE NOISE PROPERTIES OF THICK FILM RESISTORS Ph.D. Thesis
Joong-Geun Rhee 1979 156 p
Avail: Univ. Microfilms Order No. 7922886

A study was made for better understanding of the properties of the two noise sources in the resistor. A technique of calculating current noise, based on the DC current distribution, was developed to determine the dependence of the noise index on the shape of the resistor. This technique can be used in predicting the current noise increase in a resistor after trimming without time consuming experimental noise measurements. The annealing process which was adopted in this study improved the current noise properties and reduced noise level of the trimmed resistor to approximately the calculated value. However, the process did not eliminate the burst noise phenomenon which was found in some of the trimmed resistors. While tunneling current is temperature independent, current noise showed a temperature dependence at low temperatures. Dissert. Abstr.

N80-10429 Auburn Univ., Ala.
NON-RECTANGULAR MOS FIELD EFFECT DEVICES Ph.D. Thesis
Imtiaz Tarique 1979 353 p
Avail: Univ. Microfilms Order No. 7923384

Arbitrarily shaped (nonrectangular) channel and arbitrary topology gate field effect transistors are designed, analyzed and studied. Various nonrectangular geometry devices are analyzed, characterized and compared with a standard rectangular device. Several nonrectangular geometry devices are fabricated to compare the theoretical work with the actual device performance. Dissert. Abstr.

N80-10430 Washington State Univ., Pullman.
EXCITATION OF CURRENTS ON INFINITE WIRES BY VERTICAL AND HORIZONTAL ELECTRIC DIPOLES IN THE PRESENCE OF A DISSIPATIVE EARTH Ph.D. Thesis
Mohamed Arabi Usta 1979 128 p
Avail: Univ. Microfilms Order No. 7923520

The current induced on a horizontal wire above earth by an arbitrarily located Hertzian electric dipole is investigated. Three dipole orientations are considered: vertical electric dipole, horizontal electric dipole parallel to both the wire and the interface between the two media, and horizontal electric dipole parallel to the interface, but normal to the wire. The three cases are combined to give the solution for an arbitrarily oriented dipole. Computational algorithms to evaluate the induced currents are developed and numerical results for the vertical electric dipole case are discussed. Dissert. Abstr.

N80-10431 Florida Univ., Gainesville.
STUDY OF THE OPTIMUM CHARGE-TRANSFER IMAGE SENSOR Ph.D. Thesis
Hsin-Fu Tseng 1979 176 p
Avail: Univ. Microfilms Order No. 7921945

The optimum structure for a solid state image sensor is investigated. The optimum structure consists of diffused diodes for photosensing, and either a bucket brigade or charge coupled transfer register for signal readout. A matrix array with two tetrode bucket brigade readout registers is studied and models describing the operating mechanisms of the bucket brigade and image sensor devices are developed. Dissert. Abstr.

N80-10432 Houston Univ., Tex.
FREQUENCY-DOMAIN APPROACHES TO LINEAR MULTIVARIABLE CONTROL SYSTEMS DESIGNS Ph.D. Thesis
Ying-Jyi Paul Wei 1979 148 p
Avail: Univ. Microfilms Order No. 7922248

An effective method for multivariable control system designs is developed. Modeling control systems using industrial control specifications and model reduction using the mixed methods are described. Relationships between the classical control specifications and the optimal weighting factors and multivariable control system design using a noninteractive method are discussed. Dissert. Abstr.

N80-10433*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DIGITAL PSK TO BiO-L DEMODULATOR FOR 2 SUP N=(BIT RATE) CARRIER
Thomas A. Shull Aug. 1979 8 p
(NASA-TM-80159) Avail: NTIS HC A02/MF A01 CSCL 09C

A phase shift key (PSK) to BiO-L demodulator which uses standard digital integrated circuits is discussed. The demodulator produces NRZ-L bit clock, and BiO-L outputs from digital PSK input signals for which the carrier is a 2 to the Nth multiple of the bit rate. Various bit and carrier rates which are accommodated by changing various component values within the demodulator are described. The use of the unit for sinusoidal inputs as well as digital inputs is discussed. A.W.H.

N80-10434*# Bionetics Corp., Hampton, Va.
THE POTENTIAL OF CARBON FIBER INDUCED SHOCK HAZARDS IN HOUSEHOLD TOASTERS
Jerome A. Meyers Sep. 1979 24 p
(Contract NAS1-15238)
(NASA-CR-159147) Avail: NTIS HC A02/MF A01 CSCL 09C

The average exposure to carbon fibers which produced a short and potential shock hazard in a household toaster was determined. Toasters are normally in the off state. They are used for brief periods during the day and have timed cycles during which power is applied. The possibility of a short occurring from the heating element to the case was investigated to find the exposure levels at which a potential shock hazard could appear. The short produced was tested to determine its importance. J.M.S.

N80-10435*# National Aeronautics and Space Administration, Washington, D. C.
TWO-DIMENSIONAL NONSTATIONARY MODEL OF THE PROPAGATION OF AN ELECTRON BEAM IN A VACUUM
S. L. Ginzburg and V. F. Dyachenko Oct. 1979 14 p refs Transl. into ENGLISH of Dvimernaya Nestatsionarnaya Model Rasprostraneniya Elektronnogo Puchka v Vakuume (Moscow), Preprint no. 51, 1979 22 p Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original document prepared by Academy of Sciences (USSR), Moscow
(Contract NASw-3199)
(NASA-TM-75693) Avail: NTIS HC A02/MF A01 CSCL 09C

A two dimensional nonstationary model of the propagation of a relativistic electron beam injected into a vacuum is considered. Collision effects are ignored and there are no external fields. Two types of the electron current propagation are shown from the computer simulation of the Maxwell-Vlasov equations.
A.W.H.

N80-10436# Royal Aircraft Establishment, Farnborough (England).
WEAR OF MODIFIED ELECTRICAL BRUSH MATERIAL IN VACUUM
M. Maillat, H. R. Kocher, and H. E. Hintermann Feb. 1979 35 p Transl. into ENGLISH of Rept-980-2.1, Lab. Suisse de Recherches Horlogeres, Neuchatel, 15 Jan. 1978 35 p
(RAE-Trans-2007; BR70073) Avail: NTIS HC A03/MF A01

Friction tests were carried out in a high vacuum, without any electrical current, and in one position, only, with respect to the structural orientation of the material on the electrical contacts. The wear is greater in the brushes with a composition of 84 Ag, 15 MOS2, 1 Cu by weight, than in the case of the brushes studied originally and it varies considerably from one sample to another. M.M.M.

N80-10437*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical Engineering.
NUMERICAL SIMULATION OF DYNAMICS OF BRUSHLESS DC MOTORS FOR AEROSPACE AND OTHER APPLICATIONS. VOLUME 1: MODEL DEVELOPMENT AND APPLICATIONS, PART A Final Report
N. A. O. Demerdash and T. W. Nehl 1979 188 p refs
(Contract NAS9-15091)
(NASA-CR-160349) Avail: NTIS HC A09/MF A01 CSCL 09A

The development, fabrication and evaluation of a prototype electromechanical actuator (EMA) is discussed. Application of the EMA as a motor for control surfaces in aerospace flight is examined. A mathematical model of the EMA is developed for design optimization. Nonlinearities which complicate the mathematical model are discussed. The dynamics of the EMA from the underlying physical principles are determined and a discussion of similating the control logic by means of equivalent boolean expressions is presented. A.W.H.

N80-10438# California Univ., Berkeley.
JOINT SERVICES ELECTRONICS PROGRAM Final Report, 1 May 1976 - 30 Apr. 1979
D. J. Angelakos and J. R. Whinnery 30 Jun. 1979 30 p refs
(Contract F44620-76-C-0100; AF Proj. 2305)
(AD-A072076; UCB/ERL-79/1; AFOSR-79-0981TR) Avail: NTIS HC A03/MF A01 CSCL 09/5

The Joint Services Electronics Program includes research in four major areas: quantum and optical electronics; solid state phenomenon and semiconductor devices; electromagnetics; and information systems including integrated circuits. This report constitutes a summary (for the entire three-year period) of the salient parts of the research. The research conducted for the contract period May 1, 1976, through April 30, 1979 is summarized in the following Interim Reports: Report no. ERL-76-2, 30 September 1976, Report no. UCB/ERL-77/1, 30 September 1977, and Report no. UCB/ERL-78/1, 30 September 1978. GRA

N80-10439# Westinghouse Electric Corp., Lima, Ohio. Aerospace Electrical Div.
PROGRAM FOR THE DEVELOPMENT OF A SUPERCONDUCTING GENERATOR, PHASE 2 AND 3 Final Report, Jan. 1974 - Jan. 1979
J. L. McCabria Feb. 1979 327 p refs
(Contract F33615-71-C-1591; AF Proj. 3145)
(AD-A072093; AFAPL-TR-79-2012) Avail: NTIS HC A15/MF A01 CSCL 10/2

This report summarizes work completed in Phase II and Phase III of a Program for the Development of a Superconducting Generator. A 5MW, 400 Hz, 12000 rpm generator was designed and built during Phase II. The oil cooled stator contained a 3-phase, wye connected, 5 kV, flooded winding within a laminated iron shield. The rotor contained a winding of 0.094 cm x 0.14 cm wire with 438 36 micrometers filaments of Nb-Ti superconducting alloy. A rotating dewar with a cold electro-thermal shield was used. The Phase III work consisted of a warm spin-up of the generator to design speed followed by cool-downs of the rotor. A superconducting state was not obtained in a generator configuration due to high pressure in the vacuum space which resulted in excessive gas conduction into the field winding compartment. A continuous pump-down system was incorporated into the test set-up but the helium leakage rate exceeded the capability of this system. Partial disassembly of the rotor was performed to define the areas of leakage. Further disassembly and work is required to correct this problem. GRA

N80-10440# California Univ., Livermore. Lawrence Livermore Lab.
EMITTANCE MEASUREMENTS ON FIELD EMITTER DIODES
B. Kulke and R. Kihara 5 Apr. 1979 40 p Presented at the Pulsed Power Conf., Lubbock, Tex., 12-14 Jun. 1979
(Contract W-7405-eng-48)
(UCRL-82533; Conf-790662) Avail: NTIS HC A03/MF A01

On the basis of time-integrated emittance measurements, several different types of field emitter diodes were characterized at 1 to 3 kA, 1 MeV. These measurements were part of the design effort for the injector system of a linear induction accelerator, to be used as a flash X-ray source at Lawrence Livermore Laboratory. The experimental parameters were the cathode type, the anode mesh texture, the diode spacing and voltage, and the level of collimation of the emerging beam. Experimental results presented show that over a wide range, the emittance was proportional to the level of collimation. For any one diode, with the spacing left fixed, the emittance was essentially independent of the diode voltage and current. Differential focusing of different energy beam components affects most strongly the peripheral components of the beam, and strong collimation was found to minimize the effects of momentum spread on the emittance. DOE

N80-10441# Brookhaven National Lab., Upton, N. Y.
AC SUPERCONDUCTING CABLES
E. B. Forsyth 1979 26 p refs Presented at Workshop on Public Policy Aspects of High Capacity Electric Power Transmission, Aspen, Colo., 14 May 1979
(Contract EU-76-C-02-0016)
(BNL-26016; Conf-790527-2) Avail: NTIS HC A03/MF A01

The characteristics and economics of superconducting power transmission cables are described. At present Austria is the only European country continuing this research. The USSR has an active program and U.S. efforts are concentrated at the Brookhaven Laboratory which is constructing a 100 m long 138 kV test facility. DOE

N80-10442# Bendix Corp., Kansas City, Mo.
ELECTRICAL MEASUREMENT OF PLATING THICKNESS Final Report
J. B. Mustapha Dec. 1978 21 p ref
(Contract EY-76-C-04-0613)
(BDX-613-1942-Rev) Avail: NTIS HC A02/MF A01

A resistance-measuring system using a commercial microhmmeter and four-point probes effectively determines the thickness of copper foil and plating on samples with surface dimensions large in comparison to probe spacing. Individual probe-calibration conductance curves are required. Although comparable in resolution to beta-backscatter measurements, the measuring system is faster, easier to calibrate, less expensive, and requires less operator training time. DOE

N80-10443# Los Alamos Scientific Lab., N. Mex.
THE 50kA FLUX PUMP FOR THE SUPERCONDUCTING TRANSMISSION LINE TEST BED
Stefan L. Wipf Aug. 1978 13 p refs
(Contract W-7405-eng-36)
(LA-6953-MS) Avail: NTIS HC A02/MF A01

A 50 kA, rotating field-type flux pump is suggested as a power supply for the superconducting transmission line test bed. A basic design was developed as an extension to a previous 12 kA pump. The important design principles are explained. Special emphasis is given to the less-certain aspects of the extrapolation and eight improvements are suggested. The three most important ones are choosing the material for a pump sheet, making the pump sheet out of a specially designed wire cloth, and arranging the return leads adjacent to the pump sheet through the pole gap. Other improvements easily incorporated into the basic design are shading poles, rare earth pole pieces, and superconducting outside windings. DOE

N80-10444# Princeton Univ., N. J. Plasma Physics Lab.
TRANSIENT EDDY CURRENTS ON FINITE PLANE AND TOROIDAL CONDUCTING SURFACES
D. W. Weissenburger and U. R. Christensen Apr. 1979 61 p refs
(Contract EY-76-C-02-3073)
(PPPL-1517) Avail: NTIS HC A04/MF A01

A previously presented mesh analysis method is used to calculate transient eddy currents in conducting surfaces. Example calculations are presented for a planar conducting sheet of finite dimensions and also for a toroidal conducting surface which represents the vacuum vessel of the TFTR. For the toroidal sheet, branch inductances are initially calculated by numerically intergating the vector potential function, then the branch matrix. For the flat sheet, an analytic expression is given which enables

direct calculation of the mesh inductance matrix. Streamline plots of the eddy current distribution are shown at successive time steps for each example. DOE

N80-10445# National Technical Information Service, Springfield, Va.
STRIP TRANSMISSION LINES, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Report, Mar. 1976 - May 1979
William E. Reed Jun. 1979 270 p Supersedes NTIS/PS-78/0298; NTIS/PS-77/0288; NTIS/PS-76/0254; NTIS/PS-75/239
(NTIS/PS-79/0618/3; NTIS/PS-78/0298; NTIS/PS-77/0288; NTIS/PS-76/0254; NTIS/PS-75/239) Avail: NTIS HC $28.00/MF $28.00 CSCL 09A

The technology and applications of strip transmission lines are presented. Included are: amplifiers, antennas, microstrip, integrated circuits, and couplers. (This bibliography contains 261 abstracts, 79 of which are new entries to the previous edition.) GRA

N80-10446# National Technical Information Service, Springfield, Va.
STRIP TRANSMISSION LINES. VOLUME 3: CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, Apr. 1978 - May 1979
William E. Reed Jun. 1979 229 p Supersedes NTIS/PS-78/0299; NTIS/PS-77/0290; NTIS/PS-76/0255
(NTIS/PS-79/0620/9; NTIS/PS-78/0299; NTIS/PS-77/0290; NTIS/PS-76/0255) Avail: NTIS HC $28.00/MF $28.00 CSCL 09A

Articles are presented on various technological aspects of strip transmission lines along with its applications in the design of microwave equipment, antennas, and integrated circuits. This updated bibliography contains 267 abstracts, all of which are new entries to the previous edition. GRA

N80-10447# National Technical Information Service, Springfield, Va.
STRIP TRANSMISSION LINES. VOLUME 2: CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, Mar. 1976 - May 1979
William E. Reed Jun. 1979 274 p
Avail: NTIS HC $28.00/MF $28.00 CSCL 09A

Research reports from worldwide literature are cited covering the technology, design, and applications of strip transmission lines. The applications include antennas, integrated circuits, microstrip devices, and microwave components. This updated bibliography contains 220 abstracts, none of which is new to the previous edition. GRA

N80-10448 Allerton Press, Inc., New York, N. Y.
ELECTRICAL CHARGING OF FABRIC AND FILM MATERIALS
B. G. Popov, V. N. Baldygin, and I. I. Chistyakov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 81-86 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 105-111 (For primary document see N80-10031 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Avenue, New York, N.Y. 10011; $45.00

N80-10449 Allerton Press, Inc., New York, N. Y.
PROPULSIVE NOZZLE ELECTRIFICATION
G. P. Potapov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 87-91 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4 p 112-116 (For primary document see N80-10031 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Avenue, New York, N.Y. 10011; $45.00

N80-10246*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A POINT DESIGN FOR A GYROTRON TRAVELING WAVE TUBE AMPLIFIER
A. Kupiszewski In its The Deep Space Network 15 Oct. 1979 p 33-39 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 09A

N80-10250*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DENSITY AND RELIABILITY PREDICTIONS FOR A GENERAL LOGIC STRUCTURE FOR CUSTOM LSI
M. Sievers *In its* The Deep Space Network 15 Oct. 1979 p 66-73 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 09C

N80-10282*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DSS RECEIVER THERMAL NOISE MODEL COMPARISONS
R. C. Bunce In its The Deep Space Network 15 Oct. 1979 p 161-168 (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 09C

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also 02 Aerodynamics and 77 Thermodynamics and Statistical Physics.

N80-10448 Pennsylvania State Univ., University Park.
TRANSIENT ASPECT OF HYDROPLANING: HYDROPLANING PHENOMENON DURING SUDDEN CHANGES IN THE FLUID LAYER ON A PAVEMENT Ph.D. Thesis
Satish Kumar Agrawal 1979 225 p
Avail: Univ. Microfilms Order No. 7922260

The transition from a nonhydroplaning to a hydroplaning condition is investigated. The transition from a nonhydroplaning to a hydroplaning condition takes no more than 65 milliseconds under any set of operating conditions, i.e., speed, film thickness, inflation pressure, load on the tire, and the texture. A fluid flow model, and a tire deformation model are developed. Simplifications in both the models are obtained by assuming that the contacting surfaces are smooth. The fluid flow model utilizes the theory for flow between the clearance spaces in bearing problems. An experimentally measured tire belt gap distribution is supplied to the flow model which predicts the hydrodynamic pressure distribution. An independent tire deformation model is developed by assuming the tire surface to be a semiinfinite solid. A tire deformation geometry is obtained from the tire deformation model using the hydrodynamic pressure distribution predicted by the flow model. Dissert. Abstr.

N80-10449 Kentucky Univ., Lexington.
MASS TRANSFER AND LIQUID-LIQUID DISPERSION IN AGITATED VESSELS Ph.D. Thesis
Jai Moon Lee 1978 168 p
Avail: Univ. Microfilms Order No. 7921509

The effects of impeller type, speed, size, and location, and of liquid properties on the degree of mixing of two immiscible liquids in a baffled vessel are examined. A correlation of droplet size and continuous phase mass transfer coefficients in agitated vessels with operating variables and physical properties in liquid-liquid systems are investigated. In correlating mass transfer coefficients, a realistic mechanism was developed, involving periodically varying rates of surface renewal associated with droplet circulation through varying degrees of turbulence around the agitated vessel. Dissert. Abstr.

N80-10450 Northeastern Univ., Boston, Mass.
VARIABLE SAMPLE TIME ALGORITHMS FOR MICROCOMPUTER CONTROL OF DISTRIBUTED PARAMETER SYSTEMS Ph.D. Thesis
Neil Gordon Sweerus 1979 123 p
Avail: Univ. Microfilms Order No. 7923542

The processes considered are the flow forced heat exchanger, the flow forced tubular reactor, and the wall temperature forced heat exchanger. The control algorithms, based on the steady state solution of the describing dynamic equation, exhibit good controlled response to changes of setpoint and load upsets in the presence of process parameter shifts. The variable sample time control algorithms are implemented via microcomputer on a laboratory flow forced heat exchanger. The control algorithm,

when modified to include thermocouple dynamics, responds well to setpoint changes and unmodelled load upsets of varying pipe wall temperatures. The experiment data agrees well with the simulated data. Dissert. Abstr.

N80-10451 California Inst. of Tech., Pasadena.
EXPERIMENTAL INVESTIGATION OF FIRST AND SECOND-SOUND SHOCK WAVES IN LIQUID HELIUM II Ph.D. Thesis
Jack Leroy Wise 1979 140 p
Avail: Univ. Microfilms Order No. 7922057

A gasdynamic shock which propagates through saturated helium vapor and subsequently reflects from the upper surface of a column of LHeII is studied. Highly repeatable arrival time data for the incident gasdynamic shock and the resultant first and second sound shocks in the liquid are discussed. Theoretical predictions that the temperature decreases through the pressure shock and increases through the temperature shock are evaluated. Amplitude measurements based on static detector calibrations are discussed along with temperature jump measurements for the coupled second sound shock. Dissert. Abstr.

N80-10452 State Univ. of New York at Buffalo.
ANALYTICAL SOLUTIONS FOR HEAT CONDUCTION IN ANISOTROPIC MEDIA HOMOGENEOUS IN CYLINDRICAL COORDINATES AT REST AND IN MOTION Ph.D. Thesis
Kin Chung Poon 1979 252 p
Avail: Univ. Microfilms Order No. 7921893

The heat conduction in anisotropic media which is homogeneous in circular cylindrical coordinates is investigated analytically. Both steady and unsteady states with the medium at rest or in motion are considered. Problems are limited to those of the so-called first class: free space, free space internally bounded by a cylindrical surface, infinite solid and hollow cylinders. Boundary conditions of the first, second and third kinds are considered. Green's functions are constructed whenever they are needed for the solution of inhomogeneous differential equations. Dissert. Abstr.

N80-10453 Pennsylvania State Univ., University Park.
EVALUATION OF A LOCALLY HOMOGENEOUS FLOW MODEL OF SPRAY EVAPORATION Ph.D. Thesis
Albert James Shearer 1979 152 p
Avail: Univ. Microfilms Order No. 7922346

A model of spray evaporation based on the locally homogeneous flow assumption and a second order turbulence model was developed and evaluated against a wide range of experimental conditions. The turbulence was represented by a k-epsilon-g model employing a clipped Gaussian probability density function for mixture fraction fluctuations. Profiles of mean velocity, temperature, composition, and drop size distribution are presented. An estimation of single phase jet measurements is provided. Characteristics of the spray which were predicted by the model e.g., flow width, radial profiles, turbulence quantities and the axial rate of velocity decay and mixture fraction defect are discussed. Dissert. Abstr.

N80-10454 California Inst. of Tech., Pasadena.
STUDIES ON THE MIXING IN A DENSITY-STRATIFIED SHEAR FLOW Ph.D. Thesis
Gregory Gartrell, Jr. 1979 531 p
Avail: Univ. Microfilms Order No. 7922048

The mixing in a two-layered density-stratified shear flow in a flume 40-meters long, with a cross-section of 110 cm wide by 60 cm deep was measured. The relative density difference between the layers was 0.001 or less. The initial mixing layer which developed at the inlet was found to be dominated by large, two-dimensional vortex structures. Much less turbulent mixing took place in the stratified flows than homogeneous flows. The turbulence was dominated by large turbulent bursts, during which the vertical turbulent transport of momentum, heat and turbulent kinetic energy are many times larger than their mean values. These bursts were responsible for most of the total turbulent transport of momentum, heat and turbulent kinetic energy, even though the bursts were found only intermittently. In almost all cases, the rate at which the potential energy of the fluid increased due to turbulent mixing was much less than the estimated rate of viscous dissipation of turbulent kinetic energy. Dissert. Abstr.

N80-10455 Vanderbilt Univ., Nashville, Tenn.
PROPERTIES OF STEADY, VISCOSITY STRATIFIED FLOW TO A LINE SINK Ph.D. Thesis
Thomas Michael Waliki 1979 160 p
Avail: Univ. Microfilms Order No. 7922192

A mathematical model to predict velocity distribution for steady, Newtonian, slow, laminar, two dimensional viscosity stratified flow to a line sink is presented. Three flumes using sugar and carboxy methyl cellulose to create density and viscosity gradients are described. Criteria to determine when velocity profiles are skewed are discussed. Three dimensionless parameters: (1) dimensionless viscosity gradient, (2) ratio of buoyancy to viscous forces, and (3) dimensionless distance from sink are developed to show the existence of skewness. Dissert. Abstr.

N80-10456 North Carolina State Univ. at Raleigh.
AN INVESTIGATION OF THE EFFECTS OF INTERNAL SOLIDIFICATION ON TURBULENT-FLOW HEAT TRANSFER AND PRESSURE DROP IN A HORIZONTAL TUBE Ph.D. Thesis
Samuel Boyce Thomason 1979 189 p
Avail: Univ. Microfilms Order No. 7923075

A quasi steady analysis is developed to predict the transient heat transfer and pressure drop response when freezing occurs on the wall of a tube containing turbulent flow. Steady state and transient experimental data are presented for comparison. Uniform tube wall temperature distributions are discussed. Analytical predictions of heat transfer and pressure drop when the tube wall temperature distribution in the apparatus exhibited significant nonuniformity are evaluated. Dissert. Abstr.

N80-10457*# Cornell Univ., Ithaca, N. Y. Center for Radiophysics and Space Research.
EFFECTS OF TRUNCATION IN MODAL REPRESENTATIONS OF THERMAL CONVECTION
Philip S. Marcus Nov. 1979 35 p refs
(Grants NGR-33-010-186; NSF ATM-76-10424; NSF AST-78-20708)
(NASA-CR-162251; CRSR-730) Avail: NTIS HC A03/MF A01 CSCL 20D

The Galerkin (including single-mode and Lorenz) equations were examined for convection in a sphere to determine which physical processes are neglected when the equations of motion are truncated too severely. The conclusions were tested by calculating solutions to the equations of motion for different values of the Rayleigh number and for different values of the limit of the horizontal spatial resolution. It was shown that the transitions from steady state to periodic, then to aperiodic convection depend not only on the Rayleigh number but also very strongly on the horizontal resolution. One of the effects of truncation is to enhance the high wavenumber end of the kinetic energy and thermal variance spectra. The numerical examples indicate that as long as the kinetic energy spectrum decreases with wavenumber, a truncation gives a qualitatively correct solution. M.M.M.

N80-10458*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN EXPERIMENTAL INVESTIGATION TO DETERMINE THE EFFECT OF WINDOW COOLING BY MASS INJECTION FOR THE SHUTTLE INFRARED LEESIDE TEMPERATURE SENSING (SILTS) EXPERIMENT
Pamela F. Bradley Sep. 1979 44 p refs
(NASA-TM-80170) Avail: NTIS HC A03/MF A01 CSCL 20D

The effect of mass injection on the shuttle infrared leeside temperature sensing (SILTS) pod window surfaces in reducing window heating and minimizing window lens radiation during the reentry data taking period is investigated. Heat transfer coefficients on and around the simulated windows and window cavities are determined. Heat transfer rates and window coolant flow rates are reported for the SILTS configuration. A comparison of two windows' geometries and their effects on the heat transfer rate is discussed and oil flow photographs are presented to

indicate how mass injection affects the flow field near the SILTS window. A.W.H.

N80-10458*# National Aeronautics and Space Administration, Washington, D. C.
FUNDAMENTALS OF HEAT MEASUREMENT
O. A. Gerashchenko Aug. 1979 234 p refs Transl. into ENGLISH of "Osnovy Teplometrii" (Kiev), Naukova Dumka Press, 1971 p 1-192 Original language document was announced as A72-35495 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75490) Avail: NTIS HC A11/MF A01 CSCL 20D

Various methods and devices for obtaining experimental data on heat flux density over wide ranges of temperature and pressure are examined. Laboratory tests and device fabrication details are supplemented by theoretical analyses of heat-conduction and thermoelectric effects, providing design guidelines and information relevant to further research and development. A theory defining the measure of correspondence between transducer signal and the measured heat flux is established for individual (isolated) heat flux transducers subject to space and time-dependent loading. An analysis of the properties of stacked (series-connected) transducers of various types (sandwich-type, plane, and spiral) is used to derive a similarity theory providing general governing relationships. The transducers examined are used in 36 types of derivative devices involving direct heat loss measurements, heat conduction studies, radiation pyrometry, calorimetry in medicine and industry and nuclear reactor dosimetry. Author

N80-10460*# Battelle Columbus Labs., Ohio.
SPRAY NOZZLE DESIGNS FOR AGRICULTURAL AVIATION APPLICATIONS Final Report, Oct. 1978 - Sep. 1979
K. W. Lee, A. A. Putnam, J. A. Gieseke, M. N. Golovin, and J. A. Hale 18 Sep. 1979 105 p refs
(Contract NAS3-21581)
(NASA-CR-159702) Avail: NTIS HC A06/MF A01 CSCL 20D

Techniques of generating monodisperse sprays and information concerning chemical liquids used in agricultural aviation are surveyed. The periodic dispersion of liquid jet, the spinning disk method, and ultrasonic atomization are the techniques discussed. Conceptually designed spray nozzles for generating monodisperse sprays are assessed. These are based on the classification of the drops using centrifugal force, on using two opposing liquid laden air jets, and on operating a spinning disk at an overloaded flow. Performance requirements for the designs are described and estimates of the operational characteristics are presented. A.W.H.

N80-10461*# Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering and Computer Science.
FLOW ON MAGNETIZABLE PARTICLES IN TURBULENT AIR STREAMS Ph.D. Thesis
Kent Ritter Davey Aug. 1979 265 p
(Grant NsG-1453)
(NASA-CR-162418) Avail: NTIS HC A12/MF A01 CSCL 20D

The flow of magnetizable particles in a turbulent air stream in the presence of an imposed magnetic field and the phenomenon of drag reduction produced by the introduction of particles in turbulent boundary layer are investigated. The nature of the particle magnetic force is discussed and the inherent difference between electric and magnetic precipitation is considered. The incorporation of turbulent diffusion theory with an imposed magnetic migration process both with and without inertia effects is examined. A.W.H.

N80-10462# Aerospace Corp., El Segundo, Calif. Lab. Operations.
FORCED RESPONSE OF A BLASIUS FLAT-PLATE BOUNDARY LAYER TO AN EXTERNAL VORTEX STREET Interim Report
J. W. Ellinwood 5 Jul. 1979 67 p refs
(Contract F04701-78-C-0079)
(AD-A072486; TR-0079(4940-01)-5; SAMSO-TR-79-65) Avail: NTIS HC A04/MF A01 CSCL 20/4

An asymptotic theory is presented for two-dimensional disturbances in the wake of an oscillating shedding-vortex line source and in the local presence of a semi-infinite flat plate and its boundary layer. No instabilities were sought or excited. The very large parameter is a Reynolds number; the shedding frequency is moderate. The boundary layer is comprised of three sublayers. In the outer 'edge' sublayer, where the Blasius variable is logarithmically large, the disturbance velocities are described analytically by Kelvin functions. Results compare qualitatively with previous numerical and experimental findings and indicate that the boundary layer effectively suppresses the external disturbances. Those disturbances that remain in the boundary layer peak at a finite (large) Reynolds number and finite frequency. GRA

N80-10463# Dynamics Technology, Inc., Torrance, Calif.
RE-ESTABLISHMENT OF LAMINAR FLOW ON A HEATED SUBMERGED VEHICLE
E. Reshotko, R. L. Gran, and K. T. S. Tzou Jul. 1979 59 p refs
(Contract N00014-77-C-0005)
(AD-A072566; DT-7802-10) Avail: NTIS HC A04/MF A01 CSCL 20/4

In order to study the process by which laminar flow is re-established after a heated submerged vehicle encounters a patch of turbulent flow, an analytical model has been formulated which simulates the heat transfer characteristics of the external skin and internal heating passage of such a vehicle. This model considers the energy equations for the external skin and for the internal heating passage and the coupling between them due to heat transfer to the external flow. Numerical solutions to this coupled set of equations for a number of turbulent patch scenarios have been obtained by an explicit finite-difference procedure for a two-dimensional flat-plate example that quantitatively simulates the characteristics of a typical tow-tank test vehicle. GRA

N80-10464# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
EXPERIMENTAL INVESTIGATION OF ANNULAR CASCADE PERFORMANCE Final Technical Report, 1 Jan. 1974 - 31 Jul. 1978
B. L. McFadden May 1979 248 p refs
(AD-A072442; AFAPL-TR-79-2048) Avail: NTIS HC A11/MF A01 CSCL 20/4

The purpose of this experiment was to verify the analysis of radial equilibrium for compressible flow through a stationary cascade, where radial equilibrium is defined as uniform axial mass flow. Experimental determination of the effect of compressibility on analytical predictions of flow angle was of primary importance. Previous analytical work is summarized and those results shown. A specially designed annular flow test apparatus was constructed for this work and its features are described in detail. Finally, the results of detailed flow field surveys using three different blade angle settings are summarized and compared with both the free vortex and the Engelman analysis. In order to aid visualization of the real flow field as measured, various computerized graphical presentations of the data are shown. In addition, these survey results are compared with analytical predictions from a two-dimensional computer program developed by the General Electric Company and a three-dimensional computer program developed by AiResearch Manufacturing Company of Arizona. GRA

N80-10465# California State Univ., Long Beach. Dept. of Mechanical Engineering.
PREDICTION OF UNSTEADY TURBULENT BOUNDARY LAYERS WITH FLOW REVERSAL
Tuncer Cebeci, Lawrence W. Carr, and Peter Bradshaw 1979 7 p refs Presented at the 2d Symp. on Turbulent Shear Flows, London, 2-4 Jul. 1979
(Contract N00019-78-M-0466)
(AD-A072548) Avail: NTIS HC A02/MF A01 CSCL 20/4

The prediction of unsteady turbulent boundary layers with flow reversal is of importance in a number of aerodynamic problems, notably in dynamic stall, buffeting and gust studies. However, some of the more popular turbulence models implicitly assume that the wall shear is positive and their extension to unsteady flows with flow reversal is not easy. It requires a modification of the functional form of the law of the wall and

the manner in which the wall shear is determined. Two near-wall assumptions are considered here. In the first, the near wall grid point is located in the logarithmic region and the law of the wall is used to link the flow properties at this grid point to the wall. In the second, a Van Driest formulation due to Cebeci and Smith is used and implies that the grid point closest to the wall will occur in the viscous sublayer. GRA

N80-10468# Sandia Labs., Albuquerque, N. Mex.
HEAT TRANSFER INTO THE INFINITE REGION EXTERNAL TO A CYLINDER
D. E. Amos Nov. 1978 17 p refs
(Contract EX-76-C-04-0789)
(SAND-78-1942) Avail: NTIS HC A02/MF A01

Numerical procedures for evaluation of the transient heat flux from a cylinder, across a barrier, into the exterior region are described for the case of zero initial temperature with constant physical properties. These include the evaluation of an integral representation and an asymptotic expansion in time for t as it approaches 0, uniform in the dimensionless heat tranfer coefficient. The analysis is implemented in a computer subroutine HFLUX. DOE

N80-10467# Los Alamos Scientific Lab., N. Mex.
HEAT PIPE THERMAL CONTROL OF SLENDER OPTICS PROBES
F. C. Prenger, Jr. 1979 20 p Presented at the AIAA Terrestrial Energy Systems Conf., Orlando, Fla., 4 Jun. 1979
(Contract W-7405-eng-36)
(LA-UR-78-3169; Conf-790611-1) Avail: NTIS HC A02/MF A01

The thermal design for a stereographic viewing system is presented. The design incorporates an annular heat pipe and thermal isolation techniques. Test results are compared with design predictions for a prototype configuration. Test data obtained during heat pipe startup showing temperature gradients along the evaporator wall are presented. Correlations relating maximum wall temperature differences to a liquid Reynolds number were obtained at low power levels. These results are compared with Nusselt's falling film theory. DOE

N80-10468# Brookhaven National Lab., Upton, N. Y. Dept. of Nuclear Energy.
ONE-DIMENSIONAL MODEL OF VAPOR GENERATION IN STEADY FLASHING FLOW
B. J. C. Wu, P. Saha, N. Abuaf, and O. C. Jones, Jr. 1979 11 p refs Presented at the ANS annual meeting, Atlanta, Ga., 3 Jun. 1979
(Contract EY-76-C-02-0016)
(BNL-NUREG-25616; Conf-790602-6) Avail: NTIS HC A02/MF A01

A nonequilibrium vapor generation model is described and applied to results of flashing experiments. The transition from liquid to two phase flow must be understood in order to predict the critical flow rates of a vapor-liquid mixture discharging into a low pressure environment. DOE

N80-10469# Idaho National Engineering Lab., Idaho Falls.
MEASUREMENT OF PHASE VELOCITIES IN MIST FLOWS USING STAGNATION PROBES
J. R. Fincke and V. A. Deason Mar. 1979 41 p refs
(Contract EY-76-C-07-1570)
(NUREG-CR-0648; TREE-1350) Avail: NTIS HC A03/MF A01

Details of techniques required to determine local phase velocities and drop size are presented along with a sampling technique for obtaining liquid flow rate. Requirements for the successful probe design are discussed. The details of operation in steady state flows are given, as well as recomendations concerning extrapolation to transient flows. Experimental results obtained in steady state airwater mist flows are detailed. The ratio of mass flow rate of gas to liquid was varied from 1.0 to 8.0, and the superficial gas velocity was varied from 35 to 80 m/s. Flow regimes covered are annular mist, dispersed mist, and stratified mist. Local slip ratios between 1.0 and 6.0 were measured, with most measured slip ratios lying between 1.0 and 2.0. DOE

N80-10470# Los Alamos Scientific Lab., N. Mex.
VNAP: A COMPUTER PROGRAM FOR COMPUTATION OF TWO-DIMENSIONAL, TIME-DEPENDENT COMPRESSIBLE, VISCOUS, INTERNAL FLOW
M. C. Cline Nov. 1978 177 p refs
(Contract W-7405-eng-36)
(LA-7326) Avail: NTIS HC A09/MF A01

A computer program, VNAP, for calculating viscous, as well as inviscid, steady and unsteady, internal flow is presented. The Navier-Stokes equations for two dimensional, time dependent, compressible flow are solved using the second-order accurate, MacCormack finite difference scheme. The boundary mesh points, except no-slip wall points, are calculated using a characteristic scheme with the viscous terms treated as source functions. The no-slip wall points are computed using the MacCormack scheme with the derivatives normal to the wall approximated by one-sided differences. An explicit artificial viscosity is included for shock calculations, and a mixing length model is included for turbulent flows. The fluid is assumed to be a perfect gas. The steady-state solution is obtained as the asymptotic solution for large time. The flow boundaries may be arbitrary curved solid walls or free jet envelopes. Typical problems that can be solved are flow in pipes and ducts; converging, converging-diverging, and plug nozzles; subsonic and supersonic inlets; and free jet expansions. DOE

N80-10471# California Univ., Livermore. Lawrence Livermore Lab.
INTRODUCTION TO HYDRODYNAMICS
M. L. Wilkins 9 Jan. 1979 43 p refs
(Contract W-7405-eng-48)
(UCID-18016) Avail: NTIS HC A03/MF A01

Various aspects of hydrodynamics and elastic-plastic flow are introduced for the purpose of defining hydrodynamic terms and explaining what some of the important hydrodynamic concepts are. Included are views on the hydrodynamic theory along with some fundamental hydrodynamic equations, discontinuities, and shock, detonation, and elastic-plastic waves. Applications of hydrodynamic theory to material equations of state, spall, Taylor instabilities, and detonation pressure measurements are discussed. DOE

N80-10472# Los Alamos Scientific Lab., N. Mex.
PERFORMANCE LIMITS FOR LIQUID-METAL HEAT PIPES CONTAINING LONG ADIABATIC SECTIONS
F. Coyne Prenger, Jr. and J. E. Kemme 1979 6 p refs Presented at 14th Intersociety Energy Conversion Conf., Boston, 5-10 Aug. 1979
(Contract W-7405-eng-36)
(LA-UR-79-1241) Avail: NTIS HC A02/MF A01

Analytical and experimental investigation of the performance limits of liquid-metal heat pipes containing long adiabatic sections were made. An analytical model describing the vapor flow and including the effects of wall friction and compressibility is presented. Performance limits and axial temperature profiles of a sodium-filled, stainless steel heat pipe were measured for comparison with the analytical results. Complete validation of the analytical model requires further experiments. The results show that a transition from laminar turbulent vapor flow occurs in the adiabatic section with an accompanying decrease in the heat pipe performance limit. The reduced performance results from an increased wall friction factor for the turbulent flow. DOE

N80-10473# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
UNSTEADY LAMINAR-FLOW SEPARATION IN TUBES. 2: THE EFFECT OF VARIATIONS IN THE FREQUENCY AND AMPLITUDE OF FLOW OSCILLATIONS Final Report, 1 Sep. 1974 - 30 Nov. 1977
Daniel J. Schneck and Frederic J. Walburn Jun. 1979 138 p refs
(Grant NSF ENG-74-20142)
(PB-296968/1; VPI-E-79-21) Avail: NTIS HC A07/MF A01 CSCL 20D

A laser Doppler anemometer technique was developed and used to study steady and unsteady flow through rigid circular tubes. Investigation of the symmetry of the separation pattern revealed a marked dependence on the Reynolds number. The

trajectory of the point of flow separation as a function of the unsteady Reynolds number is reported. Finally, applicability of current flow separation criteria are discussed in view of fluid behavior upstream of the separation point. GRA

N80-10474# National Bureau of Standards, Washington, D. C.
A LINEARIZED FINITE DIFFERENCE COMPUTATION OF FLUID HEATING IN AN ENCLOSURE Interim Report
Ronald G. Rehm, Martin R. Cordes, Howard R. Baum, and John Lewis May 1979 78 p refs Prepared in cooperation with Boeing Computer Services, Inc., Seattle, Wash.
(PB-298053/0; NBSIR-79-1754) Avail: NTIS
HC A05/MF A01 CSCL 13M

In an earlier paper, approximate equations of motion were derived which are applicable to nondissipative, very nonadiabatic, buoyant flows of a perfect gas. In the present paper, these approximate equations are recast in a form in which they can be integrated by finite difference techniques. Results of some computations are presented using computer-generated plots. A discussion is given of the software required to generate these plots. The principal application of interest to the authors is buoyant convection induced in room fires. GRA

N80-10004 Allerton Press, Inc., New York, N. Y.
STUDY OF SELF-OSCILLATORY LIQUID FILM FLOW REGIME IN COAXIAL AIR STREAM
V. G. Bazarov and L. A. Lyulka *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 12-15 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 19-24 (For primary document see N80-10001 01-01)
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N80-10005 Allerton Press, Inc., New York, N. Y.
DYNAMIC CHARACTERISTICS OF LIQUID FILM IN HYBRID HYDROSTATIC BEARING
A. I. Belousov and Yu. A. Ravikovich *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 16-19 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 25-29 (For primary document see N80-10001 01-01)
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N80-10007 Allerton Press, Inc., New York, N. Y.
ON THE STUDY OF HEAT TRANSFER WITH THE AID OF A LOCAL HEAT FLUX SENSOR
Yu. F. Gortyshov, I. M. Varfolomeev, and R. A. Yaushev *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 25-27 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 38-41 (For primary document see N80-10001 01-01)
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N80-10009 Allerton Press, Inc., New York, N. Y.
EXPERIMENTAL STUDY OF THE GASDYNAMIC CHARACTERISTICS OF A STATOR CASCADE WITH COOLING AIR DISCHARGE THROUGH THE VANE SURFACE
O. N. Emin, I. I. Kutysh, and P. I. Shvartsman *In its* Soviet Aeron., Vol. 21, No. 3, 1978 p 31-36 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 46-53 (For primary document see N80-10001 01-01)
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N80-10010 Allerton Press, Inc., New York, N. Y.
ON THE INFLUENCE OF LIQUID OSCILLATIONS IN FUEL LINE ON THE HEAD OF A PUMP OPERATING IN REGIMES WITH REVERSE FLOW
V. G. Kinelev *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 37-39 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 54-57 (For primary document see N80-10001 01-01)
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N80-10012 Allerton Press, Inc., New York, N. Y.
MOST RATIONAL LINEARIZATION OF NONLINEAR UNSTEADY HEAT CONDUCTION PROBLEMS
N. L. Menshikh *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 44-47 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 63-67 (For primary document see N80-10001 01-01)
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N80-10019 Allerton Press, Inc., New York, N. Y.
EXPERIMENTAL STUDY OF TURBULENCE ENERGY BALANCE COMPONENTS IN THE SECTION OF A RETARDED TURBULENT BOUNDARY LAYER
E. V. Shishov, P. S. Roganov, V. M. Belov, and V. N. Afanasev *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 78-81 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 108-112 (For primary document see N80-10001 01-01)
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N80-10020 Allerton Press, Inc., New York, N. Y.
THE TURBULENT BOUNDARY LAYER ON A CURVILINEAR SURFACE
A. V. Shchukin *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 82-87 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 113-120 (For primary document see N80-10001 01-01)
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N80-10021 Allerton Press, Inc., New York, N. Y.
CORRELATION OF EXPERIMENTAL DATA ON TWO-PHASE-FLOW HEAT TRANSFER IN CONVERGENT PART OF A NOZZLE
V. K. Shchukin, A. I. Mironov, V. A. Filin, and N. N. Kovalnogov *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 88-92 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 121-126 (For primary document see N80-10001 01-01)
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N80-10026 Allerton Press, Inc., New York, N. Y.
EXPERIMENTAL STUDY OF CURVILINEAR SURFACE FILM COOLING EFFECTIVENESS
V. I. Lokai, A. V. Skchukin, and R. M. Khairutdinov *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 113-115 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 150-153 (For primary document see N80-10001 01-01)
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N80-10030 Allerton Press, Inc., New York, N. Y.
EXPERIMENTAL DETERMINATION OF HEAT TRANSFER COEFFICIENT WHEN EMPTYING GAS VESSELS
L. G. Chirva, A. V. Polshin, and V. S. Kostenko *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 127-129 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 165-167 (For primary document see N80-10001 01-01)
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N80-10033 Allerton Press, Inc., New York, N. Y.
MATHEMATICAL MODEL AND STABILITY OF HYDRAULIC SERVO DRIVE WITH JET-THROTTLE REGULATION
A. I. Bazhenov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 6-9 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4 1978 p 11-15 (For primary document see N80-10031 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Avenue, New York, N. Y. 10011; $45.00

N80-10036 Allerton Press, Inc., New York, N. Y.
ON THE LAMINAR BOUNDARY ON THE SURFACE OF A

CYLINDER MOVING IN A FLUID
V. A. Bashkin and G. M. Dzhamgarov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 22-26 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4 1978 p 29-35 (For primary document see N80-10031 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Avenue, New York, N. Y. 10011; $45.00

N80-10064 Allerton Press, Inc., New York, N. Y.
HEAT TRANSFER IN TURBULENT GAS FLOWS WITH HIGH-FREQUENCY PRESSURE OSCILLATIONS
B. M. Galitseiskii *In its* Soviet Aeron., v. 22, no. 1 1979 p 11-15 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 17-23 (For primary document see N80-10061 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Ave., New York, N. Y. 10011; $50.00

N80-10072 Allerton Press, Inc., New York, N. Y.
LIQUID EJECTOR WITH PERFORATED NOZZLE
A. A. Stolyarov *In its* Soviet Aeron., v. 22, no. 1 1979 p 50-53 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Techn. (USSR), v. 22, no. 1, 1979 p 64-68 (For primary document see N80-10061 01-01)
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N80-10073 Allerton Press, Inc., New York, N. Y.
GENERALIZED HEAT AND MASS TRANSFER LAW FOR INTERNAL FLOWS
A. A. Khalatov *In its* Soviet Aeron., v. 22, no. 1 1979 p 54-57 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 69-72 (For primary document see N80-10061 01-01)
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N80-10078 Allerton Press, Inc., New York, N. Y.
APPROXIMATE CALCULATION OF THE LAMINAR BOUNDARY LAYER IN MICRONOZZLES
F. A. Akhmedyanova, A. A. Vaindiner, P. G. Danilaev, and N. F. Salikhov *In its* Soviet Aeron., v. 22, no. 1 1979 p 68-70 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 86-88 (For primary document see N80-10061 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Ave., New York, N. Y. 10011; $50.00

N80-10080 Allerton Press, Inc., New York, N. Y.
***APPLICATION OF GRADIENT METHOD TO STUDY OF* HEAT TRANSFER IN AXISYMMETRIC CHANNELS OF DIFFERENT CONFIGURATION**
N. N. Kovalnogov *In its* Soviet Aeron., v. 22, no. 1 1979 p 80-83 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 96-100 (For primary document see N80-10061 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Ave., New York, N. Y. 10011; $50.00

N80-10084 Allerton Press, Inc., New York, N. Y.
SEMI-EMPIRICAL METHOD FOR DETERMINING LOCAL *HEAT TRANSFER COEFFICIENTS FOR FLOW AROUND A* SPHERE
L. I. Kudryashev and N. I. Klyuev *In its* Soviet Aeron., v. 22, no. 1 1979 p 93-95 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 107-109 (For primary document see N80-10061 01-01)
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35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N80-10475 California Univ., Santa Barbara.
DIGITAL RECONSTRUCTION OF ACOUSTIC HOLOGRAMS Ph.D. Thesis
Nie But Tse 1979 122 p
Avail: Univ. Microfilms Order No. 7921049

Computer processing of holograms from a specific holographic system is investigated. The system consists of a linear array of receiving elements which scan a holographic plane in conjunction with a perpendicularly oriented insonifying transducer, an electronic system for demodulating received signals and a digital computer for data processing. The processing includes image reconstruction and motion correction. Two image reconstruction algorithms are discussed. A technique for reducing image degradation due to motion is presented. The motion correction is discussed for the near field and the Fresnel regions. The modification of the laboratory holographic system to improve image quality and processing speed is examined. An optimized processing procedure is developed and computer simulations are presented. Dissert. Abstr.

N80-10476*# ITT Aerospace/Optical Div., Fort Wayne, Ind.
STUDY OF A STEREO ELECTRO-OPTICAL TRACKER SYSTEM FOR THE MEASUREMENT OF MODEL DEFORMATIONS AT THE NATIONAL TRANSONIC FACILITY Final Report
Richard J. Hertel Oct. 1979 82 p refs
(Contract NAS1-15629)
(NASA-CR-159146) Avail: NTIS HC A05/MF A01 CSCL 14B

An electro-optical method to measure the aeroelastic deformations of wind tunnel models is examined. The multi-target tracking performance of one of the two electronic cameras comprising the stereo pair is modeled and measured. The properties of the targets at the model, the camera optics, target illumination, number of targets, acquisition time, target velocities, and tracker performance are considered. The electronic camera system is shown to be capable of locating, measuring, and following the positions of 5 to 50 targets attached to the model at measuring rates up to 5000 targets per second. A.W.H.

N80-10477*# National Aeronautics and Space Administration, Washington, D. C.
***SEMICONDUCTOR MILLIMETER AND CENTIMETER WAVE* RADIOMETER FOR THE STUDY OF THE RADIATION OF AN UNDERLYING SURFACE**
G. S. Bordonskiy, A. N. Zazinov, Yu. A. Kirsanov, M. K. Kravchenko, Yu. B. Khapin, A. N. Sharapov, and V. S. Etkin Oct. 1979 25 p refs Transl. into ENGLISH of Report Pr-321 (Moscow), 1977 25 p Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original document prepared by Academy of Sciences (USSR), Moscow
(Contract NASw-3199)
(NASA-TM-75671; Pr-321) Avail: NTIS HC A02/MF A01 CSCL 14B

A theoretical and experimental investigation of a superheterodyne radiometer system with input frequency converter and intermediate frequency modulation is presented. Conditions are found, at which the temperature sensitivity of the device does not deteriorate. A sensitivity function to external parameters (temperature, heterodyne power) of a radiometer system with intermediate frequency modulation and a Schottky diode frequency converter is presented and calculated. Use of a frequency converter at the second harmonic of the heterodyne permitted simplication of the radiometer design and the use of a semiconductor heterodyne. A 3 cm range intermediate frequency amplifier permitted the use of centimeter wave radiometer signals.

Fluctuation sensitivity of radiometers with a 1 sec time constant is 0.3 K at 3.4 mm and 0.06 K at 3 cm. Author

N80-10478*# National Aeronautics and Space Administration, Washington, D. C.

EXPERIMENTAL STUDY OF THE VIDICON SYSTEM FOR INFORMATION RECORDING USING THE WIDE-GAP SPARK CHAMBER OF GAMMA - TELESCOPE GAMMA-I

V. V. Akimov, R. Bazer-Bashiv, S. A. Voronov, A. M. Galper, M. Gre, L. F. Kalinkin, P. Kerl, V. D. Kozlov, F. Koten, and D. Kretol Sep. 1979 19 p refs Transl. into ENGLISH of "Eksperimental'noye Issledovaniye Vidikonnoy Sistemy dlya Syoma Informatsii s Shirokozazornykh Iskrovykh Kamer Gamma-Telescopa 'Gamma-I'", Rept. Pr-436 Acad. of Sci. USSR, Inst. of Space Res., Moscow, 1978 p 1-22 Transl. by Scientific Translation Service, Santa Barbara, Calif.

(Contract NASw-3198)

(NASA-TM-75644; Pr-436) Avail: NTIS HC A02/MF A01 CSCL 14E

The development of the gamma ray telescope is investigated. The wide gap spark chambers, used to identify the gamma quanta and to determine the directions of their arrival, are examined. Two systems of information recording with the spark chambers photographic and vidicon system are compared. A.W.H.

N80-10479# Terra Tek, Inc., Salt Lake City, Utah.

HIGH-TEMPERATURE STRAIN INSTRUMENTATION FEASIBILITY STUDY Final Report

Lynn M. Barker May 1979 41 p

(Contract DAAG46-78-C-0033)

(AD-A072443; AMMRC-TR-79-30) Avail: NTIS HC A03/MF A01 CSCL 20/11

The problem of instrumenting the strain in all three coordinate directions on a body whose surface temperature is 1100 to 1650 C was addressed. No pre-existing satisfactory solution was found in the literature. A new needle and pivot point (NAPP) mechanism for strain instrumentation is therefore proposed. Calculations of the thermal and mechanical performance of the device indicate that it should satisfy the desired instrumentation characteristics. The device could be used to measure triaxial strains simultaneously at 40 or more different locations on a test structure. GRA

N80-10480# Brookhaven National Lab., Upton, N. Y.

HEAT OF VAPORIZATION SPECTROMETER

D. Edwards, Jr. 1979 14 p refs Presented at the 25th Natl. Vacuum Symp., San Francisco, 27 Nov. 1978

(Contract EY-76-C-02-0016)

(BNL-24973; Conf-781130-3) Avail: NTIS HC A02/MF A01

Multilayer desorption measurements of various substances adsorbed on a stainless steel substrate were taken. They showed desorption profiles consistent with a zeroth order desorption model. The singleness of the desorption transients together with their narrow peak widths makes the technique ideally suited for a heat of vaporization spectrometer for either substance analysis or identification. DOE

N80-10481# Sandia Labs., Albuquerque, N. Mex. Systems Research Div.

CODED APERTURE IMAGING: A COMPARISON BETWEEN FRESNEL ZONE APERTURES AND UNIFORMLY RE-*DUNDANT ARRAY APERTURES*

K. W. Chu Oct. 1978 61 p refs

(Contract EX-76-C-04-0789)

(SAND-78-1625) Avail: NTIS HC A04/MF A01

Using computer simulations, comparisons were made between a one dimensional Fresnel zone aperture and a one dimensional uniformly redundant array aperture. In the former case, artifacts may produce severe distortions in the reconstructed image, and an iterative technique to remove these artifacts is described. In comparison to the Fresnel zone aperture, images reconstructed from uniformly redundant array apertures had few artifacts. A quantum noise analysis for the uniformly redundant array is presented to indicate the conditions under which a uniformly redundant array will produce a signal noise advantage compared to an equivalent pinhole aperture. DOE

N80-10482# Idaho National Engineering Lab., Idaho Falls.

HIGH TEMPERATURE TUNGSTEN-RHENIUM THERMOCOUPLES WITH MOLYBDENUM-RHENIUM SHEATHS

S. C. Wilkins Oct. 1978 51 p refs

(Contract EY-76-C-07-1570)

(TFBP-TR-285) Avail: NTIS HC A04/MF A01

A W5Re/W26Re thermocouple with a molybdenum-rhenium alloy sheath for short term in-pile temperature measurement is described. Details of special measuring junction fabrication and of a laser-welded, strain-relieved splice to a compensating extension cable are included. Results of laboratory testing up to 2430 C are presented and recommendations for improved performance and longer lifetime are discussed. DOE

N80-10483# California Univ., Berkeley. Lawrence Berkeley Lab.

NOISE CONSIDERATIONS IN MILLIMETER-WAVE SPECTROMETERS

W. D. Zoellner, W. F. Kolbe, and B. Leskovar Dec. 1978 28 p refs

(Contract W-7405-eng-48)

(LBL-7294) Avail: NTIS HC A03/MF A01

An improved version of a microwave spectrometer operating in the vicinity of 70 GHz is described. The spectrometer, which incorporates a Fabry-Perot resonator superheterodyne detection for high sensitivity is designed for the detection of gaseous pollutants and other atmospheric constituents. The instrument is capable of detecting polar molecules with absorption coefficients as small as 2 x 10 to the minus 9th power/cm. For sulphur dioxide diluted in air, this sensitivity corresponds to a detection limit of 1.2 ppm without preconcentration and with a time constant of 1 second. Measurements and analysis of the noise contributions limiting the sensitivity are presented. DOE

36 LASERS AND MASERS

Includes parametric amplifiers.

N80-10484 Rochester Univ., N. Y.

SCALAR DIFFRACTION ANALYSIS OF LIGHT SCATTERING BY EPITHELIAL CELLS FROM A LINE FOCUSED LASER *BEAM Ph.D. Thesis*

James Alan Hardy 1979 211 p

Avail: Univ. Microfilms Order No. 7922935

The scattering of light from a line focused laser beam by biological cells is investigated as a source of structural information about the cells. The line focus irradiation scheme and the nature of the information sought are determined by the intended implementation of developed techniques in a rapid cell analysis instrument. Cell orientation, shape and the presence of cytoplasmic and nuclear boundaries within the line focus are investigated. The Fraunhofer approximation to scalar diffraction theory is appropriate to describe scattering from epithelial cells. Computer simulations based upon a fast Fourier transform algorithm are used to model scattering from simple geometrical figures such as circles, ellipses and squares. The results of the simulations are used both to suggest and interpret experiments carried out on several test objects in addition to epithelial cells.

Dissert. Abstr.

N80-10485 Rochester Univ., N. Y.

MULTIPLE PHOTON PROCESS IN SF6 Ph.D. Thesis

Mordekhay Rothschild 1979 140 p

Avail: Univ. Microfilms Order No. 7922960

An investigation of multiple-photon phenomena which may occur during the interaction of certain polyatomic molecules with powerful infrared lasers is presented. The basic mechanisms involved in the multiple photon absorption (MPA) and multiple photon dissociation (MPD) in these molecules were elucidated. During MPA some molecules absorb more than one photon, whose frequency is close to that of a vibrational normal mode of the molecule. In certain instances, if a high level of vibrational excitation of the molecule is attained through MPA, the molecule may dissociate. This process is then called MPD. The molecule SF6 was chosen as representative of a whole class of molecules

and the laser employed in the experiments was a pulsed CO2 laser. Dissert. Abstr.

N80-10488# *Illinois Univ. at Urbana-Champaign. Dept. of* Chemistry.

CHEMILUMINESCENCE OF DIPHENYL PEROXIDE. *PULSED LASER SPECTROPHOTOMETRIC DETECTION OF* RADICAL ION INTERMEDIATES ON THE CIEEL PATH

Gary B. Schuster and Keith A. Horn 5 Jul. 1979 15 p refs *Sponsored in part by NSF Submitted for publication*

(Contract N00014-76-C-0745; NR Proj. 051-616)

(AD-A071151) Avail: NTIS HC A02/MF A01 CSCL 07/4

The reactions of diphenyl peroxide with a series of electronically excited state hydrocarbon reactants were investigated by pulsed laser spectrophotometry. It was found that the primary reaction between the excited state and the peroxide is electron transfer to generate a radical ion pair. The ions were detected by their characteristic absorption spectra. The reaction kinetics were measured and used to verify the generation of radical ion intermediates in the chemically initiated electron-exchange luminescence (CIEEL) mechanism for the chemiluminescence of organic peroxides. GRA

N80-10487# Hughes Research Labs., Malibu, Calif.

OPTICAL-MICROWAVE INTERACTIONS IN SEMICONDUCTOR DEVICES *Quarterly Report, 1 Apr. - 30 Jun. 1979*

L. Figueroa, C. Slayman, and H. W. Yen Jul. 1979 29 p refs

(Contract N00173-78-C-0192)

(AD-A072539; QR-1) Avail: NTIS HC A03/MF A01 CSCL 20/5

The study of injection-laser mode locking was continued. The lasers were operated in the external cavity configuration using a piece of optical fiber. Pumping injection lasers with short electrical pulses at a frequency corresponding to the round-trip transit frequency of the cavity generated stable optical pulses. A modified GaAs FET structure was designed such that efficient optical coupling to the active region of the device causes a strong optical-microwave interaction in the device for high-speed optical detection, optical injection locking of oscillators and optical-microwave mixing in amplifiers. Liquid phase epitaxial growth was used to grow the necessary GaAs and Ga0.6Al0.4As layers on a semi-insulating substrate. Device fabrication is still in progress. Preliminary results showed that the devices exhibited a reasonable source-drain current versus source-drain voltage characteristic and are quite uniform over the entire wafer. A GaAs Gunn diode was designed and fabricated during the quarter. The diodes will be used to study the interaction between the injection laser's output and the high field Gunn domain in the diode. The ultimate goal is to achieve the efficient high-speed pulsed modulation of injection lasers. Diodes with various lengths were fabricated and tested using a curve tracer. Differential negative resistance was observed in all the diodes tested. GRA

N80-10488# *Army* Electronics Research and Development Command, Fort Monmouth, N. J. Night Vision and Electro-Optics Labs.

A PERFORMANCE EVALUATION OF MINI-LASER CARTRIDGE DEVICES Final Report

J. W. Strozyk and L. Wacenskie May 1979 20 p

(AD-A072505; DELNV-TR-79-1) Avail: NTIS HC A02/MF A01 CSCL 20/5

The development of miniaturized laser rangefinders and laser sighting systems has evolved as a direct result of large scale integration of electronics and more recently, the integration of the laser transmitter assembly into a 'cartridge' device. This paper addresses the evaluation of the latest 'bonded cartridge' device design, presents performance data and provides a comparitive assessment with previous devices. Laser performance is discussed in terms of corrected beam divergence, beam quality and beam stability as well as energy efficiency. Although the number of devices available for examination was small (6), the improvement in beam characteristics over previous designs was readily observed. GRA

N80-10489# Naval Research Lab., Washington, D. C.

DARPA-NRL LASER PROGRAM Annual Report, 1 Oct. 1977 - 30 Sep. 1978

S. K. Searles 28 Jun. 1979 164 p refs

(DARPA Order 4019)

(AD-A072359; NRL-MR-4019) Avail: NTIS HC A08/MF A01 CSCL 20/5

The DARPA-NRL Program is concerned with the development of laser technology. New concepts in photolytic pumping and wavelength conversion have been investigated. Limitations of the mercury halide lasers have been studied. The basic physics of the XeF laser has been examined theoretically and experimentally. Author (GRA)

N80-10490# California Univ., Livermore. Lawrence Livermore Lab.

DEVELOPMENT OF AN ACTIVELY MODELOCKED AND Q-SWITCHED OSCILLATOR FOR LASER FUSION PROGRAM AT LLL

D. J. Kuizenga 19 Jul. 1978 8 p refs Presented at Meeting on Picosecond Phenomena, Hilton Head, S.C., 24 May 1978 *(Contract W-7405-eng-48)*

(UCRL-81365; Conf-780579) Avail: NTIS HC A02/MF A01

A method was developed that allows the mode-locking process to go to its steady state condition before the laser is Q-switched. This is done by pumping the laser quasi-cw for about 5 ms. During this time, the loss in the Q-switch is such that the laser will just slightly go above threshold. The active modulator is on during this time, and the laser oscillates quasi-cw for a period long enough to obtain stable transform-limited short pulses. At the end of this prelase period, the laser is Q-switched, and a train of stable, short pulses is obtained. DOE

N80-10491# Los Alamos Scientific Lab., N. Mex.

MID-INFRARED OPTICALLY PUMPED LASERS

C. R. Jones Aug. 1979 20 p refs

(Contract W-7405-eng-36)

(LA-7331-MS; UC-22) Avail: NTIS HC A02/MF A01

Optically pumped lasers emitting in the middle-infrared spectral region are reviewed. General features of these lasers are discussed, and published data on them are summarized. Approximate lasing wavelengths are indicated, and a few of the more important mid-infrared optically pumped lasers are treated in more detail. DOE

N80-10492# Los Alamos Scientific Lab., N. Mex.

DIFFRACTION MEASUREMENTS FOR LASL'S ANTARES LASER SYSTEM

J. E. Sollid Aug. 1978 36 p refs

(Contract W-7405-eng-36)

(LA-7443-MS) Avail: NTIS HC A03/MF A01

Beam diffraction, both in the near field and the far field, was studied to assess the effect of the 12-segmented annular exit window proposed for the Antares laser system. The near-field studies indicate that diffraction spillover effects are less than 5% and that hot spots in the aperture are not apt to exceed the design flux level of 2J/sq cm. The far-field investigation shows that the segments in the annulus may be considered independently and, therefore, energy and intensity add up incoherently. Also, the total intensity distribution is well approximated by 12 times the intensity distribution in a circular aperture with the same area as a single sector. DOE

N80-10493# California Univ., Livermore. Lawrence Livermore Lab.

PRELIMINARY MACHINING STUDY ON FLUOROBERYLLATE LASER GLASS Final Report

Phillip C. Baker, R. T. Maney, and G. M. Sanger 11 Jun. 1979 25 p refs

(Contract W-7405-eng-48)

(UCID-18201) Avail: NTIS HC A02/MF A01

A series of scribe tests of fluoroberyllate glass using a radiused diamond tool indicated the possibility of this glass being a candidate for diamond machining. Based on the scribe tests, an effort was undertaken using existing conventional equipment to explore the machinability of fluoroberyllate (836 Corning glass) with a machine parameter study. A series of cuts of varying depths was completed using heptyl alcohol as a coolant. Nomarski microphotographs and Celvite profilometer scans were made of the surface after each run. Microphotographs of the tool were made to document tool wear. The results indicate that substantial

amounts of the fluoroberyllate glass could be removed without any visible damage to the diamond tool. DOE

N80-10260*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
S-BAND ULTRALOW-NOISE TRAVELING-WAVE MASER
D. Trowbridge and J. Loreman *In its* The Deep Space Network 15 Oct. 1979 p 148-154 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 20E

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N80-10494* National Aeronautics and Space Administration, Pasadena Office, Calif.
SODIUM STORAGE AND INJECTION SYSTEM Patent
Alvin R. Keeton, inventor (to NASA) (Westinghouse Electric Corp., Trafford, Pa.) Issued 25 Sep. 1979 7 p Filed 24 Feb. 1978 Supersedes N78-22187 (16 - 13, p 1679) Sponsored by NASA
(NASA-Case-NPO-14384-1; US-Patent-4,169,129; US-Patent-Appl-SN-880728; US-Patent-Class-422-242; US-Patent-Class-210-186; US-Patent-Class-210-340; US-Patent-Class-239-102; US-Patent-Class-239-302; US-Patent-Class-422-187; US-Patent-Class-422-199; US-Patent-Class-422-208; US-Patent-Class-422-235; US-Patent-Class-423-350) Avail: US Patent and Trademark Office CSCL 13I

A sodium storage and injection system for delivering atomized liquid sodium to a chemical reactor employed in the production of solar grade silicon is disclosed. The system is adapted to accommodate start-up, shut-down, normal and emergency operations, and is characterized by (1) a jacketed injection nozzle adapted to atomize liquefied sodium and (2) a supply circuit connected to the nozzle for delivering the liquefied sodium. The supply circuit is comprised of a plurality of replaceable sodium containment vessels, a pump interposed between the vessels and the nozzle, and a pressurizing circuit including a source of inert gas connected with the vessels for maintaining the sodium under pressure.
Official Gazette of the U.S. Patent and Trademark Office

N80-10495 Engineering Sciences Data Unit, London (England).
EQUILIBRIUM TEMPERATURES IN SELF-CONTAINED BEARING ASSEMBLIES. PART 2: FIRST APPROXIMATION TO TEMPERATURE RISE
1979 11 p Also published as ISSN-0141-2590
(ESDU-78027; ISBN-0-85679-231-4; ISSN-0141-2590) For information on availability of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC $290.50

Upper and lower estimates of the temperature rise in a simple bearing assembly in order to assess the need for redesign or more refined analysis were made. ESDU

N80-10496 *North Carolina State Univ. at Raleigh.*
DEVELOPMENT OF MATHEMATICAL MODELS TO DESCRIBE THE WEAR PROCESS IN VISCOELASTIC MATERIALS Ph.D. Thesis
Hamdi Ahmed Elsayed Saleh 1979 150 p
Avail: Univ. Microfilms Order No. 7923067

Mathematical models are presented for steady state solutions for stress and temperature for longitudinal wave propagation in a composite model of an elastic tire cord supported in a viscoelastic rubber matrix with a thermal coupling subjected to a sinusoidal shear stress at the interface. The models provide the capability of predicting the pressure and temperature at the interface between the cord and rubber matrix when subjected to dynamic loading simulating the tire operating conditions. The interfacial temperature of four tires varying in size and construction were calculated. The calculated results indicate the cords and rubber matrices in bias ply tires are more extensible in the longitudinal direction than the radial ply tires. In the radial ply tire with wire belts the cords were less extensible than a similar tire with a nylon cord belt. In all cases the extensibility of the cord increases with the angular speed of the tire. Dissert. Abstr.

N80-10497*# National Aeronautics and Space Administration, Washington, D. C.
ALGORITHM FOR CONSTRUCTING THE PROGRAMMED MOTION OF A BOUNDING VEHICLE FOR THE FLIGHT PHASE
V. V. Lapshin Aug. 1979 47 p refs Transl. into ENGLISH of "Algoritm Postroeniya Programmnogo Dvizheniya Prygayushchego Apparata dlya Fazy Poleta", Prep. No. 26 Acad. of Sci. USSR, Inst. of Appl. Math., Moscow, 1979 p 1-53 Transl. by Leo Kanner Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75668; Preprint-26) Avail: NTIS HC A03/MF A01 CSCL 13I

The construction of the programmed motion of a multileg bounding vehicle in the flight was studied. An algorithm is given for solving the boundary value problem for constructing this programmed motion. If the motion is shown to be symmetrical, a simplified use of the algorithm can be applied. A method is proposed for nonimpact of the legs during lift-off of the vehicle, and for softness at touchdown. Tables are utilized to construct this programmed motion over a broad set of standard motion conditions. F.O.S.

N80-10498# Ebasco Services, Inc., New York.
APPLICATIONS SURVEY: EVALUATION OF GAS TURBINE NEEDS Final Report
R. R. Bennett, H. J. Riedel, and J. E. Kruck Nov. 1978 151 p
(EPRI Proj. 990-1)
(EPRI-AF-911) Avail: NTIS HC A08/MF A01

The results of an extensive survey of 38 representative utilities to determine their needs for future gas turbine unit additions and to determine potentially beneficial research projects for resolving current problems with gas turbine units are presented with supporting statistics. DOE

N80-10499# Oak Ridge National Lab., Tenn.
IMPROVEMENTS IN REMOTE EQUIPMENT TORQUING AND FASTENING
John Garin 1978 32 p ref Presented at the ANS 26th Conf. on Remote Systems Technology, Washington, D. C., 12-17 Nov. 1978
(Contract W-7405-eng-26)
(CONF-781105-64) Avail: NTIS HC A03/MF A01

Specialized subassemblies to torque and fasten equipment in a remotely controlled environment were developed. The subassemblies were adapted into a system that would provide remote torquing and fastening in the range of 200 to 750 nm(150 to 550 ft/lb). DOE

N80-10500# Idaho National Engineering Lab., Idaho Falls.
IMPROVED RELAP4 JET PUMP MODEL Code Assessment and Applications Data Report
E. E. Ross Apr. 1979 60 p refs Sponsored in part by the Nuclear Regulatory Commission
(Contract EY-76-C-07-1570)
(CAAP-TR-046) Avail: NTIS HC A04/MF A01

A RELAP4 Jet Pump Model was developed based on subscale jet pump tests. This work was part of the INEL technical support to the NRC for Industry Cooperative Programs. Model evaluation results show the model to be an improvement of the previous model. DOE

N80-10501# Sandia Labs., Albuquerque, N. Mex.
DEPENDENCE OF FRACTURE TOUGHNESS OF MOLYBDENUM LASER WELDS ON DENTRITIC SPACING AND IN SITU TITANIUM ADDITIONS
J. L. Jellison 1979 12 p refs Presented at the US/UK Symp. on Neutron Generators, Albuquerque, New Mex., 21 May 1979
(Contract EY-76-C-04-0789)
(SAND-79-0193C; CONF-790518-6) Avail: NTIS HC A02/MF A01

The fracture toughness of molybdenum welds was improved

by in situ gettering of oxygen by means of physically deposited titanium. The addition of titanium suppressed brittle intergranular fracture. Pulsed laser welds (both Nd:YAG and CO2) exhibited superior toughness to that of continuous wave CO2 laser welds. Also, welds of vacuum arc remelted grades were tougher than those of sintered molybdenum. DOE

N80-10502# Oak Ridge National Lab., Tenn.
STEAM TURBINES
John T. Meador Oct. 1978 110 p refs
(Contract W-31-109-eng-38)
(ANL/CES/TE-78-7) Avail: NTIS HC A06/MF A01

The selection, classification, and average shaft efficiencies are discussed of some small-to-medium size steam turbines that can be used for base-load, turbine-generator units to meet both the electrical and thermal energy demands of several communities, as specified in evaluations for Integrated Community Energy Systems (ICES). Shaft efficiencies are evaluated by combining the average internal turbine efficiencies and the Rankine steam-cycle efficiencies for several combinations of steam inlet conditions under conditions of both fully condensing and non condensing exhaust steam. Efficiencies of very small turbines for mechanical drive of compressors or power plant auxiliaries also are estimated. Two examples are given of the input data necessary to establish preliminary costs for an industrial-extraction type turbine that may be adapted to ICES. Some data on operational considerations and cost factors are included. DOE

N80-10023 Allerton Press, Inc., New York, N. Y.
MATHEMATICAL MODELS OF THE PROCESS OF VIBRO-ABRASIVE GRINDING OF PARTS WITH AUTONOMOUS VIBRATIONS IN THE VIBROMACHINE CONTAINER
F. S. Yunusov, V. G. Gazizov, N. P. Zinovev, A. A. Nazipov, and V. V. Yakunin *In its* Soviet Aeron., Vol. 21, No. 3 1978 p 97-103 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh. (USSR), v. 21, no. 3, 1978 p 133-141 (For primary document see N80-10001 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Ave., N.Y. 10011; $45.00

N80-10066 Allerton Press, Inc., New York, N. Y.
MEASUREMENT OF LIQUID PUMP TORQUE IN THE STARTING REGIME
N. S. Ershov, V. V. Ramodina, and V. V. Chervakov *In its* Soviet Aeron., v. 22, no. 1 1979 p 20-25 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 12, no. 1, 1979 p 30-35 (For primary document see N80-10061 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Ave., New York, N. Y. 10011; $50.00

N80-10070 Allerton Press, Inc., New York, N. Y.
METHOD FOR CALCULATING OPTIMAL PARAMETERS OF HIGH-PRESSURE PNEUMATIC DRIVES
M. Ya. Panov, A. M. Kurganov, and V. P. Kozelkov *In its* Soviet Aeron., v. 22, no. 1 1979 p 39-43 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 51-56 (For primary document see N80-10061 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Ave., New York, N. Y. 10011; $50.00

N80-10081 Allerton Press, Inc., New York, N. Y.
UNLOADING THE DRIVE OF GAS DISTRIBUTER VALVES OPERATING AT HIGH PRESSURES
I. A. Krivosheev, A. M. Rusak, I. M. Urakev, and Z. G. Shaikhutdinov *In its* Soviet Aeron., v. 22, no. 1 1979 p 84-86 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats Tekhn. (USSR), v. 22, no. 1, 1979 p 100-102 (For primary document see N80-10061 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Ave., New York, N. Y. 10011; $50.00

N80-10088 Allerton Press, Inc. New York, N. Y.
STUDY OF SIZE DISTRIBUTION OF OIL DROPS FORMED IN GTE OIL
P. G. Petrov and O. A. Povarov *In its* Soviet Aeron., v. 22, no. 1 1979 p 105-107 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekhn. (USSR), v. 22, no. 1, 1979 p 117-119 (For primary document see N80-10061 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Ave., New York, N. Y. 10011; $50.00

N80-10257*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ANTENNA AZIMUTH BEARING MODEL EXPERIMENT
H. McGinness *In its* The Deep Space Network 15 Oct. 1979 p 123-131 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 13I

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N80-10503# Lockheed-Georgia Co., Marietta.
RELIABILITY OF NONDESTRUCTIVE INSPECTIONS Final Report, Jul. 1974 - Dec. 1978
William H. Lewis, William H. Sproat, Bruce D. Dodd, and James M. Hamilton Dec. 1978 429 p refs
(Contracts F41608-76-D-A005; F41608-77-D-A021)
(AD-A072097; LG79ER0011; SA-ALC/MME-76-6-38-1) Avail: NTIS HC A19/MF A01 CSCL 01/3

The results of a four-year Air Force Logistics Command program to determine the reliability of Air Force nondestructive inspection capability are presented. The report completely describes the program-its objectives, scope, planning and logistics, participants, data collection, analysis, conclusions and recommendations. Actual aircraft structural samples containing fatigue damage were transported to 21 different Air Force bases and depots, where approximately 300 Air Force technicians performed ultrasonic, eddy current, penetrant and radiographic nondestructive inspections (NDI) on the samples. The same detailed NDI procedures were followed by all participating technicians. The individual results were recorded and accumulated in terms of 'finds', 'misses' and 'false calls', compared to a preliminary knowledge of actual flaw locations. A detailed teardown inspection of the samples at the end of the program verified and refined actual flaw tabulations. Results were computerized for data storage and retrieval and analyzed for each NDI method and structure sample type to provide detection probability versus flaw size (POD) curves. Other analyses provide POD curves for years training, experience, age, etc. The program results indicate that Air Force NDI needs improvement in several specific areas in order to meet existing requirements for inspection of Air Force hardware. Some conclusions were derived concerning factors that apparently affect Air Force inspection reliability. Recommendations for making both short-term and long-term improvements in NDI proficiency are presented. GRA

N80-10504# Atomics International, Golden, Colo. Rockwell Hanford Operations.
QUALITY ASSURANCE IN ALTERNATIVE ENERGY SOURCES
R. D. Hammond 2 Feb. 1979 14 p Presented at the First Annual Western Energy Quality Assurance Seminar, San Francisco, 7 Apr. 1979
(Contract EY-77-C-06-1036; Contract EY-77-C-1030)
(RHO-SA-107) Avail: NTIS HC A02/MF A01

The Hanford history, description of the radwaste efforts taking place, future plans, and highlights of the increasing role of quality assurance are outlined. DOE

N80-10505# National Technical Information Service, Springfield, Va.
NONDESTRUCTIVE ULTRASONIC TESTING AND INSPECTION. VOLUME 3: CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, May 1977 - Mar. 1979
Guy E. Habercom, Jr. Jul. 1979 180 p
(NTIS/PS-79/0636/5) Avail: NTIS HC $28.00/MF $28.00 CSCL 14B

Ultrasonic equipment and techniques for nondestruction

inspection/testing of materials and fabrication processes are investigated in these reports obtained from worldwide literature. This updated bibliography contains 172 abstracts, none of which are new entries to the previous edition. GRA

N80-10506# National Technical Information Service, Springfield, Va.
NONDESTRUCTIVE ULTRASONIC TESTING AND INSPECTION. VOLUME 4: CITATIONS FROM THE ENGINEERING INDEX DATA BASE, APRIL 1978 MAY 1979 Progress Report, Apr. 1978 - May 1979
Guy E. Habercom, Jr. Jul. 1979 267 p Supersedes NTIS/PS-78/0568; NTIS/PS-77/0404; NTIS/PS-76/0424 (NTIS/PS-79/0637/3; NTIS/PS-78/0568; NTIS/PS-77/0404; NTIS/PS-76/0424) Avail: NTIS HC $28.00/MF $28.00 CSCL 14B

Ultrasonic equipment and techniques for nondestruction inspection/testing of materials and fabrication processes are investigated in these reports obtained from worldwide literature. This updated bibliography contains 260 abstracts, all of which are new entries to the previous edition. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N80-10507* National Aeronautics and Space Administration. Pasadena Office, Calif.
SYSTEM FOR DETECTING SUBSTRUCTURE MICROFRACTURES AND METHOD THEREFORE Patent
Shakkottai P. Parthasarathy (JPL) and Keshavaiyengar Y. Narasimhan, inventors (to NASA) (JPL) Issued 18 Sep. 1979 6 p Filed 6 Sep. 1977 Supersedes N79-20556 (17 - 11, p 1455) Sponsored by NASA
(NASA-Case-NPO-14192-1; US-Patent-4,168,483; US-Patent-Appl-SN-830562; US-Patent-Class-367-26; US-Patent-Class-181-102; US-Patent-Class-181-105; US-Patent-Class-467-2-8) Avail: US Patent and Trademark Office CSCL 20N

Bursts of signals at different frequencies are induced into substructure, adjacent to a borehole. The return signals from each burst of signals are normalized to compensate for the attenuation experienced by more distant return signals. The peak amplitudes of return signals, above a selected level, are cut off, and an average signal is produced from the normalized amplitude-limited return signals of each burst. The averaged signals of the return signals of all the signal bursts at the different frequencies are processed to provide a combined signal, whose amplitude is related to the microfracture density of the substructure adjacent to the borehole.

Official Gazette of the U.S. Patent and Trademark Office

N80-10508 Colorado Univ. at Boulder.
NONLINEAR INELASTIC STABILITY OF FLEXIBLY-CONNECTED PLANE STEEL FRAMES Ph.D. Thesis
Michael Harold Ackroyd 1979 330 p

The effects of flexible beam-to-column connections on the ultimate capacity of regular, steel building frames were investigated. A classical elastic stability analysis procedure is formulated which accounts for connections having linear moment-rotation characteristics. This procedure is applied to a simple portal frame to determine the effects of connection stiffness on the elastic buckling capacity of the frame. It is seen that increased connection stiffness results in increased elastic buckling capacity. A procedure is developed which accounts for nonlinear flexible connections and inelastic behavior of the beams and columns comprising the frame. The resulting procedure, which is based on a secant stiffness approach, is programmed for digital computer to analyze frames under proportionately increasing loads until the ultimate capacity is reached. Dissert. Abstr.

N80-10509 Rensselaer Polytechnic Inst., Troy, N. Y.
THEORY OF REALIZABILITY FOR LINEARLY ELASTIC TRUSS-STRUCTURES AND RELATED APPLICATIONS IN OPTIMUM STRUCTURAL DESIGN Ph.D. Thesis
Eleftherios Lefcochilos 1979 142 p
Avail: Univ. Microfilms Order No. 7922233

The optimum design of linearly elastic truss-structures under multiple loading conditions in canonical schemes without making use of approximations are formulated. Consequently, by implementing appropriate mathematical programming methods, a solution representing the global optimum case can be obtained. The examination of the physical and deformational effects that the different loading conditions produce on the structure are reported. The scope of such a course is termed, henceforth, the subject matter of the theory of realizability. The particular objectives evolve along two distinct, though parallel, approaches representing the state of the structural effect considered; the displacement and the force approach. Dissert. Abstr.

N80-10510 Pennsylvania State Univ., University Park.
COINCIDENCE OF HIGHER-ORDER MODES: A MECHANISM OF THE EXCITATION OF CYLINDRICAL SHELL VIBRATIONS VIA INTERNAL SOUND Ph.D. Thesis
Jeremy Lee Walter 1979 180 p
Avail: Univ. Microfilms Order No. 7922360

A match in the characteristic axial phase velocity (defines a coincidence condition) between a particular spinning acoustic mode and the corresponding shell flexural mode is demonstrated. This occurs at a frequency slightly above the acoustic mode cutoff frequency. A spectral analysis of an experimentally measured pipe wall acceleration signal revealed that the maximum wall response occurs at the coincidence frequency, and not at the cutoff frequency of the mode in question. It was concluded that any and all prediction schemes for sound transmission through a pipe wall must address the contribution of spinning-mode coincidence coupling, and essentially none of the present ones do. Dissert. Abstr.

N80-10511# Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).
CONSTANT AND VARIABLE LOADING FATIGUE STRENGTH OF BLACK-HEART MALLEABLE CAST IRON REGARDING METALLURGICAL CHARACTERISTICS
H. Ostermann, H. Rueckert, and A. Engels 31 Jan. 1979 14 p refs Repr. from Giessereiforschung (Dusseldorf), vol. 1, 31 Jan. 1979 p 25-36 In GERMAN; ENGLISH summary
(ICAF-1089) Avail: NTIS HC A02/MF A01

Fatigue tests were carried out on axial loaded notched specimens made from black-heart malleable cast iron covering the range from 350 to 700 N/sq mm ultimate tensile strength. Within this range three alloys were produced according to the German specification GTS 35, GTS 55 and GTS 70; three foundries with two different melting heats which were included. The machined test bars with a final cross section of 40 x 5 mm were notched corresponding to the stress concentration factors K = 2.0 and 3.6 and in the fatigue tests subjected to axial loading with stress ratios of R = 0. For each combination of type of material and testing parameters K and R statistical data from S-N tests and 8 stepped program tests were obtained. A relation between the observed differences in fatigue properties dependent on casting and annealing techniques and some typical metallurgical characteristics so as number, shape and extension of temper-carbon nodules is presented. R.E.S.

N80-10512*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LIGHT AIRPLANE CRASH TESTS AT THREE ROLL ANGLES
Claude B. Castle and Emilio Alfaro-Bou Washington Oct. 1979 77 p refs
(NASA-TP-1477; L-12778) Avail: NTIS HC A05/MF A01 CSCL 01C

Three similar twin engine general aviation airplanes were crash tested at the Langley impact dynamics research facility at 27 m/sec and at nominal roll angles of 0 deg, -15 deg, and -30 deg. Other flight parameters were held constant. The test facility, instrumentation, test specimens, and test method are briefly described. Structural damage and accelerometer data for

each of the three impact conditions are presented and discussed. Author

N80-10513# Technion - Israel Inst. of Tech., Haifa. Material Mechanics Lab.

DYNAMIC RESPONSE OF A SLAB OF ELASTIC-VISCOPLASTIC MATERIAL THAT EXHIBITS INDUCED PLASTIC ANISOTROPY Interim Report

J. Aboudi and S. R. Bodner Aug. 1979 38 p refs Sponsored in part by European Office of Aerospace Research and Development

(Contract F49620-79-C-0156)

(ISSN-0072-9310; MML-67; SR-1) Avail: NTIS HC A03/MF A01

Various two dimensional problems of the dynamic loading of a slab are solved for a material characterization that is elastic-viscoplastic and exhibits anisotropic work-hardening. The governing constitutive equations are based on a unified formulation which requires neither a yield criterion nor loading or unloading conditions. They include multidimensional anisotropic effects induced by the plastic deformation history. The theory also considers plastic compressibility which depends on the extent of anisotropy. A numerical procedure for solving equations is developed which incorporates the history dependent anisotropic hardening effects. Cases considered are the dynamic penetration of a slab by a rigid cylindrical indenter, and a distributed force rapidly applied over part of the slab surface. Both conditions of fixed and free rear surfaces of the slab are examined. A uniaxial problem is also considered in which different bases for the anisotropic hardening law are examined. Author

N80-10514*# Engineering Information Systems, Inc., San Jose, Calif.

USER'S GUIDE: SPAR PROCESSOR MN ANALYSIS OF INELASTIC THREE-DIMENSIONAL SOLIDS, PART 2

W. D. Whetstone and C. E. Jones Sep. 1979 16 p refs

(Contract NAS8-32365)

(NASA-CR-161321; EISI/A3088) Avail: NTIS HC A02/MF A01 CSCL 20K

A user's guide to the processor MN is presented. The processor MN is used to analyze systems in which some or all of the three dimensional elements have nonlinear stress-strain relations. Representations of nonlinear material behavior implemented into the system are provided including Von Mises yield criterion, the Prandtl-Reuss flow rule, and the mechanical sublayer method. The primary data sets used to represent the state of the system are presented. A.W.H.

N80-10515*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.

EFFECT OF TIME DEPENDENT FLIGHT LOADS ON JT9D-7 PERFORMANCE DETERIORATION

A. Jay and B. L. Lewis 21 Aug. 1979 73 p refs

(Contract NAS3-20632)

(NASA-CR-159681; PWA-5512-45) Avail: NTIS HC A04/MF A01 CSCL 01C

The results of a modal transient analysis of the engine/aircraft system are presented. The response of the JT9D to analytically simulated vertical gusts and landings was predicted using a NASTRAN finite element mathematical model of the JT9D/747 propulsion system. The NASTRAN finite element model of the propulsion system included engine structural models of the fan, low/high pressure compressors, diffuser/turbine cases, and high/low pressure rotors, as well as nacelle models of the inlet cowl, tailcone, and wing pylon. The analysis conducted predicts that an insignificant level of JT9D-7 performance deterioration would occur due to a typical vertical gust encounter or a typical revenue service landing. Analysis of a high sink rate landing with a heavy fuel load indicates the possibility of local wear, however, the lack of an accurate dynamic rotor/seal interference model precludes an accurate quantitative evaluation of performance change for this once-per-airframe-life event. J.M.S.

N80-10516*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

COUPLED ROTOR AND FUSELAGE EQUATIONS OF MOTION

William Warmbrodt Oct. 1979 82 p refs

(NASA-TM-81153) Avail: NTIS HC A05/MF A01 CSCL 20K

The governing equations of motion of a helicopter rotor coupled to a rigid body fuselage are derived. A consistent formulation is used to derive nonlinear periodic coefficient equations of motion which are used to study coupled rotor/fuselage dynamics in forward flight. Rotor/fuselage coupling is documented and the importance of an ordering scheme in deriving nonlinear equations of motion is reviewed. The nature of the final equations and the use of multiblade coordinates are discussed. A.W.H.

N80-10517# Royal Aircraft Establishment, Farnborough (England).

A NEW METHOD OF ELECTRIC MEASUREMENT OF CRACK LENGTH

G. Baudin and H. Policella May 1979 24 p refs Transl. into ENGLISH from Rech. Aerosp. (France), v. 4, 1978 p 195-203

(RAE-Trans-2016; BR70094) Avail: NTIS HC A02/MF A01

Improvements on devices used for determining the existence or propagation of a crack in an electrically conducting material are presented: The procedure consists in ensuring a pulsed electric supply, which reduces the response time of the measurement, and, more important still, makes it free of noise and of the constant current amplifier zero drift. In case of cyclic loadings, the pulse may be synchronized with these loadings. The great flexibility of use, the performance obtained, and applications of the instrument are emphasized. M.M.M.

N80-10518# Dayton Univ., Ohio.

COLLAPSE LOAD ANALYSIS FOR PLATES AND SHELLS Final Report, Oct. 1977 - Oct. 1978

Nelson R. Bauld, Jr. and Kailasam Satyamurthy May 1979 217 p refs

(Contract F33615-76-C-3145; AF Proj. 2307)

(AD-A071649; AFFDL-TR-79-3038) Avail: NTIS HC A10/MF A01 CSCL 20/11

This report presents a theoretical foundation, computational procedures, and a computer program for the analyses of bifurcation or collapse of circular, cylindrical panels and rectangular plates. Discretization is accomplished via a variable-spacing, orthogonal, finite-difference grid using the principle of total potential energy. The modified Newton-Raphson iterative procedure is used to generate nonlinear load-deflection curves and a separate branch of the program provides a bifurcation analysis based on linear, prebuckling behavior. The program is capable of handling rectangular cut-out and initial geometric imperfections; a variety of zero force and zero displacement boundary conditions; and point loads, line loads, and distributed loads in transverse, longitudinal and circumferential directions, as well as axial end-compression. GRA

N80-10519# Lehigh Univ., Bethlehem, Pa. Inst. of Fracture and Solid Mechanics.

FRACTURE MECHANICS AND SURFACE CHEMISTRY STUDIES OF FATIGUE CRACK GROWTH IN AN ALUMINUM ALLOY

R. P. Wei, P. S. Pao, R. G. Hart, T. W. Weir, and G. W. Simmons Apr. 1979 36 p refs

(Contract N00014-75-C-0543)

(AD-A071438; IFSM-79-98; TR-9) Avail: NTIS HC A03/MF A01 CSCL 11/6

Fracture mechanics and surface chemistry studies were carried out to develop further understanding of the influence of water vapor on fatigue crack growth in aluminum alloys. The room temperature fatigue crack growth response was determined for 2219-T851 aluminum alloy exposed to water vapor at presures from 1 Pa to 30 Pa over a range of stress intensity factors (K). Data were also obtained in vacuum and dehumidified argon. The test results showed that, at a frequency of 5 Hz, the rate of crack growth is essentially unaffected by water vapor until a threshold pressure is reached. Above this threshold, the rates increased, reaching a maximum within one order of magnitude increase in vapor pressure. GRA

N80-10520# Naval Research Lab., Washington, D. C.

MATERIAL RESPONSE TO 500 keV PROTON BEAMS AT INTENSITIES BELOW 1 GW/cm2 Final Report

T. R. Tucker, D. Mosher, and D. Hinshelwood 25 Jul. 1979 28 p

(AD-A072416; NRL-MR-4043) Avail: NTIS HC A03/MF A01 CSCL 20/11

Stress-wave response of several materials to 500 keV, 1 kA/sq cm, proton pulses was monitored by shadowgraphy and interferometric methods. Results indicated the presence of both direct absorption and interaction plasma effects. Incident beam power densities of about 1 GW/sq cm are necessary for plasma effects to dominate the interaction. GRA

N80-10521# Army Materials and Mechanics Research Center, Watertown, Mass.

ILLUSTRATIONS OF TWO SIMPLE METHODS OF DETERMINING STRESS INTENSITY FACTORS FROM STRESS CONCENTRATIONS AND STRESS DISTRIBUTIONS Final Report

Francis I. Baratta Apr. 1979 23 p refs

(AD-A072199; AMMRC-MS-79-3) Avail: NTIS HC A02/MF A01 CSCL 20/11

Illustrative examples of two methods of determining approximate stress intensity factors from (a) stress concentration factors and (b) from stress distributions are presented. In the first case several example problems are presented whereby stress intensity factors are obtained from known stress concentration factor data. These illustrative problems include data obtained from both closed form and experimental solutions. The results of this method are compared to a well-known, accurate analysis, and guidelines regarding such usage are presented. In the second case, several approximate methods of determining stress intensity factors, utilizing stress distributions available in the literature, are presented to the reader. Example problems are illustrated and compared to more accurate results when available. Estimates of the accuracy and limited guidance on the usage of such methods are given. GRA

N80-10522# AiResearch Mfg. Co., Phoenix, Ariz.

CONTACT STRESS ANALYSIS OF CERAMIC-TO-METAL INTERFACES Final Report

D. G. Finger 24 May 1979 30 p refs

(Contract N00014-78-C-0547)

(AD-A072073; AiResearch-21-3239) Avail: NTIS HC A03/MF A01 CSCL 20/11

The program was specifically directed to study contact stresses at the interface between inserted ceramic turbine blades (hot-pressed silicon nitride) and a metal rotor, but the method of analysis, results, and conclusions also provided a better understanding of contact stresses at ceramic-to-metal and ceramic-to-ceramic interfaces for static components. A finite-element stress analysis procedure and structural evaluation technique consistent with the statistical nature of ceramic materials was generated. Specimen testing was conducted to obtain validation of these techniques and provide insight as to possible modifications of stress simulation or fracture prediction criteria. The objective was to develop a design methodology, which will improve on current design methods, thus permitting the design of interface configurations in which strengths more indicative of the inherent strength of ceramic materials can be realized. GRA

N80-10523# Texas A&M Univ., College Station.

AN INCREMENTAL FORM OF THE SINGLE-INTEGRAL NONLINEAR VISCOELASTIC THEORY FOR ELASTIC-PLASTIC-CREEP FINITE ELEMENT ANALYSIS

Duane R. Sanders and Walter E. Haisler Mar. 1979 13 p refs

(Contract N00014-76-C-0150)

(AD-A072151; TR-3275-79-1) Avail: NTIS HC A02/MF A01 CSCL 20/11

A single-integral nonlinear viscoelastic theory is cast into a generalized incremental form for use in predicting creep response of materials. The incremental creep constitutive model is tailored for use in an incremental finite element program wherein the equations of motion are integrated numerically step-by-step. Recursive relations for material memory parameters are developed which allow the retention of all past history, prior to the current time step, and require integration over the current time step only. The creep model parameters required in the theory are obtainable from a standard creep and recovery test. The incorporation of the model within an incremental elastic-plastic finite element formulation is outlined. GRA

N80-10524# Texas A&M Univ., College Station. Dept. of Aerospace Engineering.

AN INVESTIGATION INTO THE COMBINED ISOTROPIC-KINEMATIC WORKHARDENING RULE Interim Report

David H. Allen 30 May 1979 14 p refs

(Contract N00014-76-C-0150)

(AD-A072152; TR-3275-79-2) Avail: NTIS HC A02/MF A01 CSCL 20/11

The Ziegler modification of the Prager kinematic workhardening rule has been shown to be a correct statement of consistency during plastic loading. Although the same modification has been used in conjunction with a combined isotropic-kinematic workhardening rule, it has not been established that this latter model renders an acceptable statement of consistency. This paper shows that the Ziegler modification used with the combined isotropic-kinematic workhardening rule not only satisfies the consistency condition, but is also computationally more different than a direct employment of the consistency condition. GRA

N80-10525# Texas A&M Univ., College Station. Dept. of Aerospace Engineering.

THE APPLICATION OF THERMAL AND CREEP EFFECTS TO THE COMBINED ISOTROPIC-KINEMATIC HARDENING MODEL FOR INELASTIC STRUCTURAL ANALYSIS BY THE FINITE ELEMENT METHOD Interim Report

David H. Allen and Walter E. Haisler 31 May 1979 28 p refs

(Contract N00014-76-C-0150)

(AD-A072153; TR-3275-79-3) Avail: NTIS HC A03/MF A01 CSCL 20/11

In this paper, a formulation is presented for a combined isotropic-kinematic hardening rule which includes both creep and thermal effects. The resulting model accounts for temperature dependent material properties as well as the Bauschinger effect for average loading. The virtual work equation and resulting matrix equations are derived for implementation of the model into a general purpose finite element code. GRA

N80-10526# California Univ., Livermore. Lawrence Livermore Lab.

COMPUTER MODEL FOR DUCTILE FRACTURE

B. Moran and J. E. Reaugh 8 May 1979 24 p refs

(Contract W-7405-eng-48)

(UCID-18070) Avail: NTIS HC A02/MF A01

A computer model is described for predicting ductile fracture initiation and propagation. The computer fracture model is calibrated by simple and notched round-bar tension tests and a precracked compact tension test. The model is used to predict fracture initiation and propagation in a Charpy specimen and compare the results with experiments. The calibrated model provides a correlation between Charpy V-notch (CVN) fracture energy and any measure of fracture toughness, such as J/sub Ic/. A second simpler empirical correlation was obtained using the energy to initiate fracture in the Charpy specimen rather than total energy CVN, and compared the results with the empirical correlation of Rolfe and Novak. DOE

N80-10527# Oak Ridge National Lab., Tenn.

STRESS ANALYSIS OF CYLINDRICAL PRESSURE VESSELS WITH CLOSELY SPACED NOZZLES BY THE FINITE-ELEMENT METHOD. VOLUME 3: VESSELS WITH THREE NOZZLES UNDER INTERNAL PRESSURE AND EXTERNAL LOADINGS

F. K. W. Tso (System Development Corp.) and R. A. Weed (System Development Corp.) 3 Apr. 1979 59 p refs

(Contract W-7405-eng-26; DOE-IA-40-551-75; DOE-IA-40-552-75)

(NUREG-CR-0507-Vol-3; ORNL/NUREG-18/V3) Avail: NTIS HC A04/MF A01

A finite-element computer program, MULT-NOZZLE, was developed for the stress analysis of cylindrical pressure vessels with one, two, or three closely spaced reinforced nozzles. The nozzles may be unreinforced or fully reinforced according to the rules of the ASME Boiler and Pressure Vessel Code. The program consists of two modules that may be operated independently.

The first module, FEMG, automatically prepares a finite-element mesh, including the nodal point coordinates, finite-element connectivities, mesh options, and boundary value specifications for input to the finite-element solution module SAP3M. SAP3M, which is a modified and improved version of the SAP3 computer program, computes the nodal point displacements and stress tenor components and prints and/or stores the results for later postprocessing. DOE

N80-10528# Sandia Labs., Albuquerque, N. Mex.
VISCOPLASTIC FINITE ELEMENT ANALYSIS OF STEADY-STATE FORMING PROCESSES INCLUDING STRAIN HISTORY AND STRESS FLUX DEPENDENCE
P. R. Dawson 1978 26 p refs Presented at the ASME Meeting, San Francisco, 10 Dec. 1978
(Contract EY-76-C-04-0789)
(SAND-77-1663C; Conf-781202) Avail: NTIS HC A03/MF A01

A method to determine the strain history throughout a body by integration of the deformation rates or deformation gradients in an Eulerian reference frame is presented. With knowledge of the strain history, a viscoplastic formulation is extended to include strain history dependence. The extended viscoplastic formulation and strain history integration are applied to the thermomechanical analyses of slab rolling and axisymmetric extrusion. DOE

N80-10529# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
VIBRATION FREQUENCIES OF AN ARCH MODEL UNDER VARIOUS LOADING CONDITIONS Technical Report, Dec. 1978 - May 1979
Raymond H. Plaut May 1979 39 p refs
(Grant NSF ENG-77-17847)
(PB-297987/0; VPI-E-79-19) Avail: NTIS HC A03/MF A01 CSCL 20K

The loading-frequency relationship for a rigid bar model of a shallow elastic arch is studied. Three independent, concentrated, vertical loads are applied and the resulting load versus frequency curves are determined. Convexity properties and bounds are discussed. GRA

N80-10530# National Technical Information Service, Springfield, Va.
MATHEMATICAL ANALYSIS OF STRESS CRACKS. VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Report, 1974 - 1976
Guy E. Habercom, Jr. Aug. 1979 228 p
(NTIS/PS-79/0803/1) Avail: NTIS HC $28.00/MF $28.00 CSCL 20K

Stress cracks were analyzed by mathematical methods, including extensive use of finite element analysis. Various materials including metals, wood, composites, and rock were investigated. (This updated bibliography contains 219 abstracts, none of which are new entries to the previous edition.) GRA

N80-10531# National Technical Information Service, Springfield, Va.
MATHEMATICAL ANALYSIS OF STRESS CRACKS. VOLUME 3. A BIBLIOGRAPHY WITH ABSTRACTS Report, 1977 - Jul. 1979
Guy E. Habercom, Jr. Aug. 1979 127 p Supersedes NTIS/PS-78/0768; NTIS/PS-77/0645; NTIS/PS-76/0554; NTIS/PS-75/467; COM-74-10242
(NTIS/PS-79/0804/9; NTIS/PS-78/0768; NTIS/PS-77/0645; NTIS/PS-76/0554; NTIS/PS-75/467; COM-74-10242) Avail: NTIS HC $28.00/MF $28.00 CSCL 20K

Stress cracks are analyzed by mathematical methods, including extensive use of finite element analysis. Various materials, including metals, wood, composites, and rock are investigated. This updated bibliography contains 118 abstracts, 21 of which are new entries to the previous edition. GRA

N80-10532# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
USE OF COMPUTER STRUCTURAL PROGRAMS FOR THE DYNAMIC ANALYSIS OF SATELLITES STRUCTURES
R. Barboni (Rome Univ.) and G. Morelli (Compagnia Nazionale Aerospaziale, Rome) Aug. 1979 17 p refs Presented at the 4th Struct. and Mater. Panel Meeting, Florence, Sep. 1978
(AGARD-R-680; ISBN-92-835-1335-5) Avail: NTIS HC A02/MF A01

The essential aspects of computer programs for structural analysis are analyzed along with the dynamic problems of satellites. Possible future trends are outlined, and the meaningful features in dynamic structural computer programs are presented. F.O.S.

N80-10039 Allerton Press, Inc., New York, N. Y.
INFLUENCE OF INITIAL DEFLECTIONS ON BUCKLING OF CYLINDRICAL SHELLS UNDER CREEP CONDITIONS WITH COMBINED ACTION OF AXIAL COMPRESSION AND INTERNAL PRESSURE
Yu. P. Vorotilin and L. M. Kurshin *In its* Soviet Aeron., v. 21, no. 4, 1978 p 38-42 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 49-54 (For primary document see N80-10031 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Avenue, New York, N. Y. 10011; $45.00

N80-10043 Allerton Press, Inc., New York, N. Y.
ANALYSIS OF THIN-WALL BEAMS BY THE METHOD OF SEGMENTS
A. S. Kretov and V. G. Shataev *In its* Soviet Aeron., v. 21, no. 4, 1978 p 58-61 refs Transl. into ENGLISH from Izv. Vyssh. Uchab. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 75-80 (For primary document see N80-10031 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Avenue, New York, N. Y. 10011; $45.00

N80-10052 Allerton Press, Inc., New York, N. Y.
CREEP ANALYSIS OF THIN-WALL STRUCTURES SUBJECT TO TRANSIENT HEATING AND LOADING
V. G. Shataev, Yu. A. Kashfraziev, and A. G. Samartsev *In its* Soviet Aeron., v. 21, no. 4, 1978 p 103-105 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 130-132 (For primary document see N80-10031 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Avenue, New York, N. Y. 10011; $45.00

N80-10054 Allerton Press, Inc., New York, N. Y.
DETERMINATION OF STRAIN FIELDS NEAR CONCENTRATORS FROM STRAIN GAGE INDICATORS
A. L. Brushkovskii *In its* Soviet Aeron., v. 21, no. 4, 1978 p 142-144 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aeron. Tekh., (USSR), v. 21, no. 4, 1978 p 114-116 (For primary document see N80-10031 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Avenue, New York, N. Y. 10011; $45.00

N80-10055 Allerton Press, Inc., New York, N. Y.
STRESS-STRAIN DIAGRAM APPROXIMATION
I. U. Vyshedkevich *In its* Soviet Aeron., v. 21, no. 4, 1978 p 117-119 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 144-147 (For primary document see N80-10031 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Avenue, New York, N. Y. 10011; $45.00

N80-10057 Allerton Press, Inc., New York, N. Y.
ON THIN-WALL BEAM EFFECTIVE STIFFNESS
V. A. Pavlov *In its* Soviet Aeron., v. 21, no. 4, 1978 p 124-128 ref Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 151-155 (For primary document see N80-10031 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Avenue, New York, N. Y. 10011; $45.00

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see 35 Instrumentation and Photography.

N80-10533 Colorado State Univ., Fort Collins.
***CLUSTER ANALYSIS BASED ON DENSITY ESTIMATES* AND ITS APPLICATION TO LANDSAT IMAGERY Ph.D. Thesis**
John Kyoungyoon Park 1979 151 p
Avail: Univ. Microfilms Order No. 7923368

A hill sliding clustering algorithm with practical applicability to remotely sensed natural scene data was developed using the maximum likelihood decision rule. Difficulties commonly encountered in computing and storing discrete multivariate probability densities were circumvented by utilizing the idea of lexicographic probability cells. The program was successfully applied to Chippewa River Basin areas in estimating the aerial extent of various land use/land cover classes. The hill sliding program employed less heuristic input parameters and yielded more reasonable partitioning of the sample data of the Chippewa River Basin than did the ISOCLAS program. The hill sliding clustering technique has applicability for use in decomposing any multivariate normal mixture distribution into a number of unimodal distributions.
Dissert. Abstr.

N80-10534 George Washington Univ., Washington, D. C.
REGIONAL GEOCHEMICAL EXPLORATION FOR MINERAL *DEPOSITS IN THE APPALACHIANS OF CENTRAL AND* NORTHWESTERN VIRGINIA Ph.D. Thesis
Dasharatham Sayala 1979 374 p
Avail: Univ. Microfilms Order No. 7923422

Element concentrations for Ag, Au, Mo, Cu, Pb, Zn, Mn, Fe, Ni, Cr and Co, were determined in 107 soils, 159 stream sediments and 159 corresponding stream waters, using atomic absorption spectrometry. The analytical data were evaluated using regional deviation analysis (RDA), Pearson correlation coefficient estimates, and 5th order trend surfaces. Geochemical maps were produced using the SYMAP program. RDA and SYMAP graphics were effective in presenting the geochemical data. Of the eleven elements studied, Mo, Cu, Pb, Ni and Co have the greater number of stream sediment anomalies and are considered pathfinders to mineralized areas. In soils, Zn, Mo, and Co anomalies are useful in regional exploration. In the study area, soil-anomalies of Pb, Au, Ni, and Cr were found to be the most important in prospecting since these elements are relatively less mobile than others studied and are generally located closer to related mineralization.
Dissert. Abstr.

N80-10535 Colorado State Univ., Fort Collins.
***A THERMAL VEGETATION CANOPY MODEL OF SENSOR* RESPONSE Ph.D. Thesis**
Daniel Scott Kimes 1979 220 p
Avail: Univ. Microfilms Order No. 7923358

A thermal canopy signature model was developed in which the thermal behavior of a vegetation canopy is approximated by a mathematical abstraction of three infinite horizontal layers of vegetation. Simulated results suggest that canopy element geometry can significantly influence the effective radiant temperature of a sensor at various view angles above the canopy, and this phenomenon has important implications on the optimum view angle for making inferences about the target of interest.
Dissert. Abstr.

N80-10536*# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
HUMAN FACTORS IN THE DESIGN AND EVALUATION OF AVIATION MAPS
V. David Hopkin (Royal Air Force Inst. of Aviation Medicine, Farnborough, England) and Robert M. Taylor (Royal Air Force Inst. of Aviation Medicine, Farnborough, England) Jun. 1979 *259 p refs*
(AGARD-AG-225; ISBN-92-835-1318-5) Avail: NTIS HC A12/MF A01

Information processing is appraised for map design. Methods and measures for the evaluation of maps are discussed. The skills and abilities of the successful map designer and the effective map user are considered. The communication of cartographic information in aviation is discussed in the area of separating human factors data from other sources and how to apply this to man design and map reading.
A.W.H.

N80-10537*# *National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.*
EDUCATOR'S GUIDE FOR MISSION TO EARTH: LANDSAT *VIEWS THE WORLD*
Margaret A. Tindal 1978 56 p refs Original contains color illustrations
(NASA-SP-360) Avail: NTIS MF A01; SOD HC CSCL 08B

This teacher's guide is specifically designed to provide information and suggestions for using LANDSAT imagery to teach basic concepts in several content areas. Content areas include: (1) Earth science and geology; (2) environmental studies; (3) geography; and (4) social and urban studies.
R.E.S.

N80-10538*#* National Aeronautics and Space Administration. *Lyndon B. Johnson Space Center, Houston, Tex.*
APOLLO-SOYUZ TEST PROJECT. VOLUME 2: EARTH OBSERVATIONS AND PHOTOGRAPHY
Farouk El-Baz, ed. (Smithsonian Institution) and D. M. Warner, ed. (Smithsonian Institution) Washington 1979 700 p refs Original contains color illustrations 2 Vol.
(Contract NAS9-13831)
(NASA-SP-412-Vol-2) Avail: NTIS HC A99/MF A01 CSCL 05B

Visual observations of the earth are presented along with the corresponding photographs and maps for specific regions. *For individual titles, see N80-10539 through N80-10581.*

N80-10539*#* National Aeronautics and Space Administration. *Lyndon B. Johnson Space Center, Houston, Tex.*
SUMMARY OF SIGNIFICANT RESULTS
Farouk El-Baz (Smithsonian Institution), Delia M. Warner, and *R. Thomas Giuli In its Apollo-Soyuz Test Project, Vol. 2* 1979 p 1-8 ref (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 05B

A summary of the visual and photographic study of specific earth features is presented. The areas selected were in the fields of geology, desert studies, oceanography, hydrology, and meteorology.
F.O.S.

N80-10540*# *California Inst. of Tech., Pasadena.*
GEOLOGIC ANALYSIS OF ASTP PHOTOGRAPHS OF PARTS OF SOUTHERN CALIFORNIA
R. E. Powell and L. T. Silver In NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 9-27 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08G

Tectonic interpretations of the geologic features of the San Andreas, San Gabriel, and San Jacinto faults are discussed.
F.O.S.

N80-10541*# *Brown Univ., Providence, R. I.*
MARDA FAULT ZONE AND THE OPENING OF THE RED SEA
Charles A. Wood In NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 29-36 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08G

According to plate tectonic theory, Africa and Arabia were a single continental block before the Red Sea spreading center separated them. The Afar region of Ethiopia is an area of overlap

in palinspastic closings of the Red Sea, and thus Afar must be recently created crust. It is proposed that the Aisha hills have moved north-northwestward into their present position by strike-slip movement along the Marda Fault zone, a major fault belt extending more than 900 km across the Horn of Africa. Geological, geophysical, and photographic evidence are presented to support this hypothesis. F.O.S.

N80-10542*# Amherst Coll., Mass.
EVALUATION OF SATELLITE IMAGES OF THE LEVANTINE RIFT ZONE
Richard M. Foose *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 37-43 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08B

Structural and lithologic features along the Levantine Rift zone were mapped using satellite images from three sources: LANDSAT, Skylab, and Apollo-Soyuz. The accuracy and completness of these maps were checked during January 1977 on a field trip from the southern end of the Gulf of Elat to the Israeli-Syrian border. Specific structural features and regional tectonic relationships along the zone were clearly displayed on all images. In certain instances, the oblique photographs from Apollo-Soyuz were superior; but, in most cases, the vertical images from LANDSAT provided more complete and accurate relationships. The analysis of tectonic features mapped on space images concurrent with geologic mapping in the field provides an improved basis for understanding the tectonic evolution of large regions. Author

N80-10543*# Texas Univ. at Austin.
ANALYSIS OF SKYLAB AND ASTP PHOTOGRAPHS OF THE LEVANTINE (DEAD SEA) FAULT ZONE
W. R. Muehlberger, L. K. Goetz, and R. C. Belcher *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 45-62 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08B

Manned-spacecraft photographs of the Dead Sea Rift Zone (DSRZ) were studied to evaluate the fault zone. The interpretation shows a splintering of the DSRZ toward the East Anatolian Fault Zone. This splintering deranged modern drainage systems, which indicates that this region is tectonically active, and these faults constitute a major earthquake hazard. F.O.S.

N80-10544*# Missouri Univ. at Rolla.
ANALYSIS AND SYNTHESIS OF SPACE IMAGERY OF THE SOUTHEASTERN-TURKEY/NORTHWESTERN-IRAN MOBILE BELT
Paul Dean Proctor, Douglas C. Melton, Jr., Ali Ileken (Middle Eastern Technical Univ., Ankara, Turkey), and L. K. Abrams *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, *Vol. 2 1979 p 63-85 refs* (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08B

Apollo-Soyuz photographs and LANDSAT images of eastern Turkey and northwestern Iran were analyzed for major geological features to develop a regional tectonic map. The analysis revealed three major geological terrains: an autochthonous block of folded layered rocks; and allochthonous block of older, more uniform rocks with folds and faults; and a volcanic terrain. F.O.S.

N80-10545*# Ain Shams Univ., Cairo (Egypt).
STRUCTURAL PATTERN OF THE NORTHERN PART OF THE EASTERN DESERT OF EGYPT
Mohamed A. Abdel-Rahman and Hassan A. El-Etr *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 87-96 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08B

Apollo-Soyuz color photographs of the northern part of the eastern desert of Egypt were excellent for regional structural mapping because of their color fidelity and large areal coverage. The oblique Apollo-Soyuz photographs were used for the identification of faults, whereas enlarged LANDSAT images were used for planimetric mapping. Aerial photographs were also examined to verify the mapped fault lines, and it was revealed that several of the lines detected on Apollo-Soyuz photographs were, in fact, zones of narrowly spaced, parallel faults. The results suport the contention that vertical tectonics were responsible for the development of the fault pattern of the area. J.M.S.

N80-10546*# Ain Shams Univ., Cairo (Egypt).
PHOTOLINEAMENTS IN THE ASTP STEREOSTRIP OF THE WESTERN DESERT OF EGYPT
Hassan A. El-Etr, Adel R. Moustafa, and Farouk El-Baz *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 97-105 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08B

Photolineaments displayed on the Apollo-Soyuz stereostrip covering part of the western desert of Egypt were studied. Virtually all of the photolineaments detected on LANDSAT images (black-and-white as well as false-color composites) were also detected on Apollo-Soyuz photographs of the same scale and approximately the same resolution. The drawbacks of Apollo-Soyuz photographs include (1) the low base/height ratio, which limited the effective stereovision; (2) the high sun-elevation angle, which limited the shadows required to easily identify linear features; and (3) the overexposure of the central parts of the frames, particularly over the Great Sand Sea. Recommendations are made to remedy this on future earth-orbital photographic missions. J.M.S.

N80-10547*# Ain Shams Univ., Cairo (Egypt).
UTILIZATION OF ASTP PHOTOGRAPHS IN THE STUDY OF SMALL STRUCTURES IN ABU RAWASH AND WADI EL NATRUN, EGYPT
Hassan A. El-Etr and Farouk El-Baz (Smithsonian Institution) *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 107-118 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08B

Geologic structures of the northern part of the western desert of Egypt were studied utilizing enlargement of Apollo-Soyuz Test Project color photographs. The Apollo Soyuz photographs of Abu Rawash clearly show structural uplifts that brought white chalk deposits to the surface, depict the distribution of dark volcanic rocks in the region, and clearly delineate complex structures including several domes and plunging anticlines. The Apollo Soyuz photographs of Wadi el Natrun display its structures as well as the string of salt lakes within it and the barren nature of the northern and southern extremities of the depression. The photographs reveal that there is a potential for increasing the area of cultivated land on the eastern slope of the depression. J.M.S.

N80-10548*# Missouri Univ. at Rolla.
PHOTOTECTONIC ANALYSIS OF SOUTHEASTERN SPAIN FROM ASTP PHOTOGRAPHS AND LANDSAT IMAGES
Paul Dean Proctor, Kenneth B. Horrall, Douglas C. Melton, Jr., and David F. Thompson *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 119-148 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08B

The tectonic characteristics of southeastern Spain were analyzed using the Apollo Soyuz Test Project oblique color photographs and LANDSAT vertical images. Four distinct tectonic provinces were identified along with three orders of fold dimensions and two orders of lineaments. Both thrust faults and normal were shown to occur in the region. A discussion of the geologic setting of southeastern Spain is given along with the results of the phototectonic analysis. J.M.S.

N80-10549*# Ain Shams Univ., Cairo (Egypt).
EAST-WEST PERVASIVE LINEAMENTS IN CENTRAL AND SOUTHEASTERN SPAIN
Mohamed A. Abdel-Rahman *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 149-156 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08B

The lineament pattern of central and southeastern Spain was detected on photographs taken during the Apollo-Soyuz mission. The obliquity of these photographs made possible the recognition of previously unnoticed structures. The true color of the photographs also aided in identifying the lineaments. Statistical analysis indicated that the lineament pattern was not random and must be caused by geological factors. Three lineament trends

were identified. In decreasing order of significance, these were east-west, northeast, and northwest. Faults in this region were traced from a geological map, and their strikes were analyzed and found to include two preferred orientations, a northeasterly trend and a west-northwesterly trend; the first trend was more prominent. *Author*

N80-10550*# Missouri Univ. at Rolla.
PHOTOGEOLOGIC ANALYSIS OF ASTP PHOTOGRAPHS OF THE LAKE TORRENS-FLINDERS RANGES-LAKE BLANCHE AREA, SOUTH AUSTRALIA
Paul Dean Proctor and Robert Sickler *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 157-181 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08B

Excellent ASTP color prints and transparencies of the North Flinders Ranges and the adjacent Lake Torrens-Lake Blanche basin areas of South Australia were analyzed to determine the characteristics of the regional fold structures. Major folds, faults, and other lineaments were identified. Tectonic patterns and their relationships to mobile belt-plate tectonics were examined. In addition, basin forms and features were analyzed and related to the desert environment of the area. Possible rock types and the character of the widespread alluvial materials surrounding the bedrock areas were predicted. An interpretive photogeologic map covering the area of the ASTP photographs was produced. J.M.S.

N80-10551*# Arizona State Univ., Tempe.
VOLCANIC LANDFORMS AND ASTROBLEMES
R. S. Dietz and J. F. McHone (Illinois Univ. at Urbana-Champaign) *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 183-202 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08G

Apollo crewmembers, while searching for circular ground features, observed and photographed astroblemes (ancient impact scars) in Brazil and Libya, and volcanoes in Italy, the Galapagos Islands, and Mexico. The Brazilian site was previously unknown to impact scientists, and photographic measurements of the Libyan structure proved larger than measurements made by earth-based investigators. Plumes of active volcanoes in Italy were traced great distances, and the inaccessible Galapago Islands were viewed synoptically. In Mexico, a feature that had been previously identified as a possible meteorite impact site was found to be formed by a volcanic steam explosion. Author

N80-10552*# Illinois Univ. at Urbana-Champaign.
RIACHAO RING, BRAZIL: A POSSIBLE METEORITE CRATER DISCOVERED BY THE APOLLO ASTRONAUTS
J. F. McHone *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 193-202 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08B

In north-central Brazil, the Apollo crewmembers photographed a 4 km wide circular ground pattern. Although the feature was not visible on airborne radar and in near-infrared satellite images, it was clearly seen from space in the visible part of the spectrum. A ground reconnaissance of this location and of a second circular structure nearby strongly supports a meteoritic origin for both sites. Author

N80-10553*# Smithsonian Institution, Washington, D. C.
COLOR ZONING IN THE WESTERN DESERT OF EGYPT
Farouk El-Baz and Hassan A. El-Etr (Ain Shams Univ., Cairo, Egypt) *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 203-217 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08B

The Western Desert of Egypt was selected for detailed study as a type locality of the north African desert environment. In addition to astronaut observations, 55 color photographs of Egypt were obtained during the Apollo-Soyuz mission using 70 and 35 mm cameras. These photographs showed regional and local color zones that were mapped and checked in the field. The Apollo-Soyuz color data were used in the selection of areas for field investigations and in the extrapolation of knowledge to unphotographed areas of the Western Desert. One of the results, the mapping of an arable zone west of the Nile Delta, attests to the potential value of color photographs in desert study. *Author*

N80-10554*# Smithsonian Institution, Washington, D. C.
ORBITAL OBSERVATIONS OF SAND DISTRIBUTION IN THE WESTERN DESERT OF EGYPT
Ann W. Gifford, Delia M. Warner, and Farouk El-Baz *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 219-236 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08B

Apollo-Soyuz Test Project photographs of the Western Desert of Egypt were studied to discover the usefulness of orbital imagery in delineating sand deposits. A strip of Apollo-Soyuz mapping-camera photographs was used to map sand distribution patterns. Information from this strip was extrapolated to the rest of Egypt using a falsecolor mosaic of LANDSAT images. *Author*

N80-10555*# Smithsonian Institution, Washington, D. C.
PRELIMINARY ANALYSIS OF COLOR VARIATIONS OF SAND DEPOSITS IN THE WESTERN DESERT OF EGYPT
Farouk El-Baz, Marie H. Slezak, and Ted A. Maxwell *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 237-262 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08G

Astronaut observations and photographs of color variations in the Western Desert of Egypt are related to both iron oxide coating on individual grains and the presence of locally derived material in the sand deposits. The northern region of the Western Desert has the highest percentage of calcareous grains originating from local limestone outcrops. Samples from the central part of the Western Desert contain numerous iron-rich grains originating from the iron deposits of Bahariya and are locally enriched in shale fragments from the Dakhla Shale. Sands of the Great Sand Sea are relatively homogeneous, quartz-rich deposits that vary little in percentage of minor components. *R.E.S.*

N80-10556*# Smithsonian Institution, Washington, D. C.
TEMPORAL CHANGES AS DEPICTED ON ORBITAL PHOTOGRAPHS OF ARID REGIONS IN NORTH AFRICA
Marie H. Slezak and Farouk El-Baz *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 263-272 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08B

Processes typical of arid environments can be monitored from space by comparing orbital photographs taken over a period of years. Oblique photographs can be used, but best results are obtained with vertical or near-vertical photographs. Changes observed by comparing the 1975 Apollo-Soyuz photographs with data from previous missions include (1) an increase in vegetation west of the Nile Delta of approximately 1108 sq km in 10 years; (2) an average shift of 2.5 km over a 6 year period in the sand patterns of the Oweinat Mountain region at the borders between Egypt, Libya, and Sudan; and (3) a reduction in the water level of Lake Chad and dune encroachment upon the lake over a period of 9 years. *R.E.S.*

N80-10557*# Smithsonian Institution, Washington, D. C.
ASTP PHOTOGRAPHS OF SOUTHEASTERN ANGOLA
Delia M. Warner *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 273-283 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08B

Apollo-Soyuz photographs of southeastern Angola were studied to provide a preliminary description of landforms in this remote and sparsely populated region. These photographs were useful in distinguishing drainage patterns, lineament trends, rock types, and the distribution of unusual play-like features. Author

N80-10558*# Smithsonian Institution, Washington, D. C.
COLOR OF DESERT SURFACES IN THE ARABIAN PENINSULA
Farouk El-Baz *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 285-299 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08G

A detailed analysis of the Apollo-Soyuz photographs is

presented. The following facts were established: (1) available charts and maps can be updated using the orbital photographs, particularly of coastal zones; (2) geologic maps can be improved by use of the natural color photographs, which clearly delineate major geologic features and their characteristics; (3) the photographs can be used in characterizing sand fields and classifying dune forms; and (4) enlargements of the photographs can be useful in detailed studies of small areas, such as the city of Ad Dawhah (Doha), Qatar, and its environs. M.M.M.

N80-10559*# Smithsonian Institution, Washington, D. C.
MONTE DESERT OF SAN JUAN, ARGENTINA, AS PHOTOGRAPHED BY ASTP
Delia M. Warner and Farouk El-Baz *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 301-318 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08B

The photographs by the ASTP reveal that the physiographic setting of the study area is characterized by mountain-and-bolson topography controlled mainly by faulting. Most of the lineaments detected on the photographs appear to correspond to faults, and some of them may provide evidence of recent fault movement in the area. Typical topographic features include barren, deeply dissected block mountains bordered by slopes of alluvial materials that descent to a flat-floored desert basin. M.M.M.

N80-10560*# Geological Survey, Flagstaff, Ariz.
DUNES AND OTHER WINDFORMS OF CENTRAL AUSTRALIA, AND A COMPARISON WITH LINEAR DUNES ON THE MOENKOPI PLATEAU, ARIZONA
C. S. Breed and W. J. Breed (Museum of Northern Arizona, Flagstaff) *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 319-358 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08G

Internal structures of linear dunes that were examined in central Australia and in northern Arizona are mainly medium-scale, thin cross-beds or cross-laminae with dips commonly less than 20 deg. Astronauts aboard the Apollo spacecraft identified the same hue, chroma, and value of red sand in dunes of central Australia that ground survey teams found in the main body of the Simpson Desert. Ground examination confirms that within each field of dunes, relative degrees of redness can help discern sequences of depositional events in that area (given a uniform sand supply and climatic zone). It was concluded that reconnaissance from space is ideal for identifying key sites for field studies of specific geomorphic problems in remote desert regions. M.M.M.

N80-10561*# Smithsonian Institution, Washington, D. C.
DETERMINING PHOTOGRAPH LOCATIONS OVER OCEANS
S. McLafferty, M. Pryslak, and G. A. Maul (NOAA) *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 359-370 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08J

The methods used to quanitatively define the photo-locations of ocean photographs taken from the Apollo Soyuz spacecraft are described. They are based on photogrammetry, on a knowledge of the groundtracks of the spacecraft and the times during which the photographs were taken, and on a comparison with satellite imagery. Latitudes and longitudes with an estimated error of + or - 1 to + or - 3 seconds are calculated for the center points of photographs taken during mapping passes that lack photosupport data. A method is developed for determining the center points for photographs containing two or more recognizable features on landmasses. A map is provided which shows the Apollo groundtracks that correspond to the times when the photographs were taken. M.M.M.

N80-10562*# National Oceanic and Atmospheric Administration, Washington, D. C.
INTERPRETING ASTP PHOTOGRAPHS OF THE OCEAN AND LOCATING THE AREA PHOTOGRAPHED, CASE STUDY OF THE GULF OF MEXICO
G. A. Maul *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 371-383 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08J

Some of the Skylab recommendations relative to the problem of locating the ocean area obtained in the handheld-camera photographs and the problem of interpreting data in the space photographs by comparison with shipboard observations that were acquired at approximately the same time are discussed. Based on Skylab experience, the frequently observed circular cloud features were thought of as indicators of mesoscale turbulence in ocean currents. It was found that the features could be consistently explained as being attributable entirely to atmospheric changes and that the features were not associated with cold-core ocean eddies. M.M.M.

N80-10563*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
VISUAL OBSERVATIONS OVER OCEANS
R. D. Terry (Richard Terry and Assoc.) *In its* Apollo-Soyuz Test Project, Vol. 2 1979 p 385-407 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08C

Important factors in locating, identifying, describing, and photographing ocean features from space are presented. On the basis of crew comments and other findings, the following recommendations can be made for Earth observations on Space Shuttle missions: (1) flyover exercises must include observations and photography of both temperate and tropical/subtropical waters; (2) sunglint must be included during some observations of ocean features; (3) imaging remote sensors should be used together with conventional photographic systems to document visual observations; (4) greater consideration must be given to scheduling earth observation targets likely to be obscured by clouds; and (5) an annotated photographic compilation of ocean features can be used as a training aid before the mission and as a reference book during space flight. M.M.M.

N80-10564*# Scripps Institution of Oceanography, La Jolla, Calif.
ANTIPODAL SEAS
Robert E. Stevenson *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 409-429 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08J

An oceanographic experiment was conducted to learn: (1) whether or not astronauts could be trained to observe specific ocean features from space; (2) the variability of certain sea surface conditions in time and space; and (3) the role that these ocean features play in our understanding of synoptic oceanography. Sea surface and subsurface data to be compared to astronaut observations were collected by ships and aircraft from waters east of Australia, north of New Zealand, east of Ireland, and east of Spain. The analysis show that observations by man from orbiting space platforms have an important role in the development of synoptic oceanography. K.L.

N80-10565*# Smithsonian Institution, Washington, D. C.
MALTESE FRONT AND STRAIT OF SICILY OCEAN PATTERN ANALYSIS
Daniel Jean Stanley *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 431-440 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08B

Ocean surface phenomena related to turbulence, including possible internal waves, are observed in Apollo Soyuz Test Project color photographs of the eastern part of the Strait of Sicily between Djerba and the southeastern corner of Sicily. The convergence of the eastward flowing, less saline upper water of Atlantic origin and the dense intermediate water flowing underneath it in the opposite direction gives rise to the Maltese Front clearly visible off Cape Passero, Sicily. The investigation shows that the geographic position of these ocean surface features is in part related to sea floor topogaphy. The vertical coverage made from an altitude of 226 km allows good definition of turbulence phenomena and serves to supplement earlier physical oceanographic observations made of the central region of the Mediterranean Sea. K.L.

N80-10566*# Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, Maine.
OCEAN COLOR OBSERVATIONS
C. S. Yentsch, W. Sikes, J. C. Laird, and T. S. Hopkins *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 441-454 refs (For primary document see N80-10538 01-43)
(Contracts NAS5-22948; E(11-1)-2538)
Avail: NTIS HC A99/MF A01 CSCL 08J

Apollo astronauts were briefed on four features that could alter ocean color: (1) phytoplankton chlorophyll; (2) dissolved yellow substance; (3) suspended sediments; and (4) bottom reflection. Before and during the Apollo-Soyuz mission, the crew was alerted to the possibility of a red tide occurrence along the coast of new England. They were unable to obtain useful photographs because of heavy fog and cloud cover. The astronauts were successful in observing ocean discolorations, and their verbal comments indicate that they were aware of the causes and sources of these color changes. Experience on this mission suggests that ground crews can work with astronauts in attempts to locate discolorations and to determine their extent and their sources. K.L.

N80-10567*# Smithsonian Institution, Washington, D. C.
ANALYSIS OF WATER COLOR AS SEEN IN ORBITAL AND AERIAL PHOTOGRAPHS OF CAPE COD, NANTUCKET, AND MARTHA'S VINEYARD, MASSACHUSETTS
Tracey Tisdall and Farouk El-Baz *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 455-480 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08J

Coastal water color was analyzed in two Apollo-Soyuz photographs. The natural color of the photographs enabled recognition of shoals and suspended sediments, sediment transport by longshore drift, wind streaks, and crests and troughs of internal ocean waves. Comparison with high altitude aircraft photographs revealed that the aerial photographs are necessary for detailed analyses and the spaceborne photographs are useful for studying large areas. A comparison of the aerial photographs with bathymetric charts showed that numerous changes occurred in the coastlines after the charts were made. Absolute reflectance values of shoals, chlorophyll concentrations, sediments, etc. were roughly estimated, but could not be accurately determined. K.L.

N80-10568*# McGill Univ., Montreal (Quebec).
ASTP AT BARBADOS: MESOSCALE POOLS OF AMAZON RIVER WATER IN THE WESTERN TROPICAL ATLANTIC
G. Borstad *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 481-497 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08H

Sea surface data was obtained at Barbados for temperature, salinity, chlorophyll concentration, clarity, color, and plankton concentration. The data suggest a successive passage of pools of brackish Amazon River water until late August. Hence, it is unlikely that the discolored water observed by the Apollo crew during the Apollo Soyuz Test Project was due to the Orinco River. The expansive freshening of the Western Tropical Atlantic by brown colored Amazon water in July would mask any effect by the smaller Orinco. K.L.

N80-10569*# Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, Maine.
ESTIMATE OF TOTAL REFLECTANCE FROM THE ORINOCO RIVER OUTFLOW
C. S. Yentsch and Farouk El-Baz (Smithsonian Institution) *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 499-503 refs (For primary document see N80-10538 01-43)
(Contracts NAS5-22348; E(11-1)-2538)
Avail: NTIS HC A99/MF A01 CSCL 08H

The Orinoco River Delta was photographed by Apollo astronauts. The photographs show discrete water color zones that reflect the mixing of the sediment laden Orinoco outflow with the water of the tropical Atlantic. A datacolor/edge enhancer analysis, assuming a 5-percent reflectance value for the open ocean water, showed the reflectance of the area varied between 4 percent for the jungle and approximately 13 percent for sediment laden river outflow. These values approximate those obtained by direct measurements of the Mississippi River Delta water. The results confirm that the reflectance from coastal waters is not high enought to saturate instruments onboard unmanned satellites such as the Coastal Zone Scanner. K.L.

N80-10570*# National Oceanic and Atmospheric Administration, Seattle, Wash.
OBSERVATIONS OF INTERNAL-WAVE SURFACE SIGNATURES IN ASTP PHOTOGRAPHS
John R. Apel *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 505-509 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08C

Three Apollo Soyuz Test Project photographs are presented which show indications of oceanic internal gravity waves. The features are indicated by periodic changes in the optical reflectivity of the ocean surface overlying the waves. Position and conditions of the internal wave photographs are presented and theories of the structure and existence of the surface signatures are reviewed. A.W.H.

N80-10571*# Ain Shams Univ., Cairo (Egypt).
DETECTION OF A PROBABLE ANCESTRAL DELTA OF THE NILE RIVER
Mohamed A. Abdel-Rahman and Farouk El-Baz (Smithsonian Institution) *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 511-520 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01

Interpretation of a near vertical Apollo Soyuz photograph of the present Nile Delta in northern Egypt is presented. The interpretation determines an ancestral delta of the Nile River. The limits, shape, position, and age of the ancestral Nile Delta are identified. The mineralogy of the delta is reported and the geochemistry data is analyzed. A.W.H.

N80-10572*# Smithsonian Institution, Washington, D. C.
SUSPENDED-SEDIMENT DISPERSAL PATTERNS OF RIVER DELTAS PHOTOGRAPHED BY ASTP
Ted A. Maxwell *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 521-530 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08H

Orbital photographs of five river deltas are presented. Suspended sediment plume patterns are identified and are related to models of sedimentation in a deltaic environment. The relative effects of river inertia, buoyancy of suspended matter, and turbulent bed friction are evaluated using delta geometry and plume pattern. A.W.H.

N80-10573*# Environmental Defense Fund, Inc., Denver, Colo.
USE OF APOLLO-SOYUZ PHOTOGRAPHS IN COASTAL STUDIES
M. T. El-Ashry *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 531-543 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08J

The use of spaceborne photography in coastal studies is examined. Apollo Soyuz photographs of coastal zones are provided to demonstrate various areas of application in coastal studies. These include shoreline features such as barrier islands, beach ridges, salt marshes, tidal inlets, and tidal deltas; shoreline changes including identification of major areas of erosion or accretion and prediction of future changes along rapidly/changing shorelines; and information regarding littoral drift. A.W.H.

N80-10574*# Texas Univ. at Austin.
SOUTH AMERICAN RIVER MORPHOLOGY AND HYDROLOGY c63
R. K. Holz, V. R. Baker, S. M. Sutton, Jr., and M. M. Penteado-Orellana (Fundacao Univ. de Brasilia) *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 545-594 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01

A guide to the hydrologic properties of streams in the Amazon and Paraguay Basins is presented. Photographs are presented from the Apollo Soyuz Test Project of the Amazon

Basin. Stream regimes, including analyses of meander wavelengths, flood plain development, and basin morphology are discussed. Basin size, drainage network density, flood plain width, vegetation types and density, climatic factors, and terrain variability are assessed. Adjustments of changes in river morphology caused by altered water and sediment discharges and by quaternary climatic changes are discussed. A.W.H.

N80-10575*# Environmental Research and Technology, Inc., Concord, Mass.

SNOW HYDROLOGY STUDIES

M. D. Smallwood, C. J. Bowley, and J. C. Barnes *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 595-615 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 08L

Photographs from the Apollo Soyuz Test Project of snow covered areas in the northwestern United States and Canada, the Chilean Andes, and the southern Alps of New Zealand are discussed. The photographs are analyzed and a tendency for the snowline elevations to be lower in the areas surrounding the permanent snowfields and glaciers rather than in areas of seasonal snowpack is examined. A.W.H.

N80-10576*# National Oceanic and Atmospheric Administration, Washington, D. C.

MESOSCALE CLOUD PATTERNS REVEALED BY ASTP PHOTOGRAPHS

P. G. Black *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 617-634 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 04B

Complicated internal-wave patterns are revealed in Apollo-Soyuz Test Project photographs of marine fog patches. Evidence for the reflection of atmospheric wave packets at water-land boundaries is present in these patterns. Photographs of arc or ring clouds show that these clouds are associated with decaying maritime thunderstorms. The cloud-free inner ring delineates cold air tht has been transported from aloft by thunderstorm downdrafts, thus inhibiting cumulus cloud development. There is no evidence to indicate that this clear inner ring is a result of cold-core eddies in the ocean. Other interesting cloud patterns revealed by ASTP photographs include linear trails created in low stratocumulus cloud decks by passing ships and dome-shaped anvil clouds created by vigorous thunderstorms. Author

N80-10577*# Smithsonian Institution, Washington, D. C.

COMPARISON OF ASTRONAUT VISUAL COLOR OBSERVATIONS WITH ASTP PHOTOGRAPHS

Farouk El-Baz, Delia M. Warner, and Fred J. Anders *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 635-644 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 14E

Visual observations of the color of both desert and ocean scenes, made by the U.S. astronauts on the Apollo-Soyuz mission, were analyzed and compared to photographs of the same regions. During the mission, use of Munsell color chips on a specially developed 'color wheel' made the comparison possible. Colors on photographs never exactly match those observed from space; available films are less color sensitive than the human eye and do not capture the true earth colors. Determination of a color correction factor for use with the photographs was not possible because of the inconsistent variations in measured colors and because of the meager statistical basis. It is recommended that additional observations be made from earth orbit utilizing uniformly illuminated color chips. This would allow meaningful correlations between natural colors as seen from space and those depicted on orbital photographs. Author

N80-10578*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

FILM SELECTION FOR THE EARTH OBSERVATIONS AND PHOTOGRAPHY EXPERIMENT

N. T. Lamar, H. E. Lockwood (Technicolor Graphic Services, Houston, Tex.), and R. E. DAlli (Smithsonian Institution) *In its* Apollo-Soyuz Test Project, Vol. 2 1979 p 645-653 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 14E

Four color-reversal positive-transparency films were evaluated: SO-368 (normal color), SO-242 (normal color), Aerochrome Infrared 2443 (false color), and high definition Aerochrome Infrared SO-127 (false color). Film SO-127 was eliminated because of its low speed. Aerochrome Infrared 2443, selected for use in discriminating vegetation, required exposure through a Wratten 12 filter. An equivalent lens filter (520 nm cutoff) was in the approved flight-hardware inventory. Aerial Color SO-242 was found to be suitably fast for use as a high resolution, normal color film; it required no special filter. However, SO-368, a medium resolution, normal color film, required exposure through the equivalent of a Wratten 2A filter. Because this item was not in the flight-hardware inventory and could neither be acquired nor approved in time for launch, a special version of SO-368 was manufactured with a yellow dye overcoat whose absorption characteristics matched those of a 2A filter. The new film (designated QX-807) performed in every respect the same as SO-368 used with a 2A filter. Film QX-807 processing was compatible with other flight film and was done in the model 1811 Versamat Processor with EA-5 chemistry. A.R.H.

N80-10579*# Technicolor Graphic Services, Inc., Houston, Tex.

FILM EXPOSURE CALCULATIONS

H. E. Lockwood, Lincoln Perry, and R. W. Wolfe (Smithsonian Institution) *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 655-662 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 14E

The determination of camera shutter and aperture settings to produce consistently high-quality aerial and orbital photographs is a task complicated by numerous variables. These variables and specific data that may be used to systematically control them are examined. The variables discussed include sunlight, atmospheric effects, subject and season, film speed, and optical system. Data that may be used as a base reference encompass sensitometric specification for two film-chemistry processes together with parameters that have been established and used to produce good exposures for Apollo-Soyuz Test Project photography. The information presented may be used to design and implement an exposure determination system for other orbital photography missions. A.R.H.

N80-10580*# Technicolor Graphic Services, Inc., Houston, Tex.

ASTP PHOTOGRAPHIC FILM PROCESSING AND SENSITOMETRIC SUMMARY

H. E. Lockwood *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 663-666 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 14E

The procedures used for processing the camera film exposed during the Apollo-Soyuz Test Project resulted from extensive testing of each film type, and the procedures were verified in numerous simulations before the mission. Exposure control curves for both visual density and tricolor densities were established for each film type before the mission. Sensitometrically exposed control strips of film were retained during the mission for comparisons with the flight film. Processing of all film conformed to preestablished standards, and no difficulties were experienced during the film processing. Author

N80-10581*# Defense Mapping Agency Aerospace Center, St. Louis, Mo.

PHOTOGRAMMETRIC ANALYSIS OF ASTP EARTH OBSERVATIONS EXPERIMENT DATA

C. W. Baker *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 667-673 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01 CSCL 14E

Apollo-Soyuz Test Project photographs of the earth were used in photogrammetric triangulations to evaluate the spacecraft position data, the calibration of two camera lenses, and the orientation of the principal axis for each lens system. Photogrammetric triangulations were performed using 100 mm focal length photographs of California and 60 mm focal length photographs of Egypt, Syria, and Turkey. Spacecraft positions determined in the triangulation over California were within 100 m of their predicted values. However, those over Egypt, Syria, and Turkey were biased by approximately 2 km in latitude, 1.4 km in longitude, and 0.7 km in altitude. Only one element of camera calibration,

radial lens distortion, could be determined. In this case, both lenses were essentially free of distortion. Errors in camera orientation angles were approximately 1.19 deg as predicted. however, it was possible to compute and apply a misalignment matrix to all orientation data and to reduce the error to approximately 0.33 deg. A correction for each sequence of photographs could be applied to reduce the error to less than 0.01 deg. Author

N80-10582# Rochester Univ., N. Y. Dept. of Computer Science.

STRIP TREES: A HIERARCHICAL REPRESENTATION FOR MAP FEATURES

Dana H. Ballard Dec. 1978 40 p refs

(Contract N00014-78-C-0164)

(AD-A071124; TR-32) Avail: NTIS HC A03/MF A01 CSCL 08/2

There is increasing interest in map features such as points, lines and regions both as a pictoral data base for resource management and as an aid to identifying objects in aerial images. Owing to the very large amount of data involved, and the need to perform operations on this data efficiently, the representation of such features is a crucial issue. We describe a hierarchical representation of map features that consists of binary trees with a special datum at each node. This datum is called a strip and the tree that contains such data is called a strip tree. Lower levels in the tree corresponds to finer resolution representations of the map feature. The strip tree structure is a direct consequence of using the method for digitizing lines (given by Duda Hart, 1973; Turner, 1974; Douglas Peucker, 1973) and retaining all intermediate steps. This representation has several desirable properties. For features which are well-behaved, calculations such as point-membership and intersection can be resolved in O(log n) where n is the number of feature points. The map features can be efficiently encoded and displayed at various resolutions. GRA

N80-10583# Coast Guard Research and Development Center, Groton, Conn.

LONG-TERM TRACKING OF ARCTIC ICEBERGS Final Report

R. Q. Robe and D. C. Maier Apr. 1979 41 p refs

(AD-A072473; CGR/DC-8/79; USCG-D-36-79) Avail: NTIS HC A03/MF A01 CSCL 08/12

Seven Greenland icebergs were tracked, two in 1977 and five in 1978, using ADRAMS (Air-Deployable Random Access Measurement System) ice buoys. The ice buoys transmit a signal to the NIMBUS-6 satellite which is used in computing the buoy's position. Observation periods ranged from 138 days to 202 days. The tracking of two icebergs began near Disko Island, Greenland, and the tracking of the other five began on the Baffin Island side of Baffin Bay near Davis Straits. The icebergs initially located near Disko Island did not appear to be influenced by any well-defined current system, the drift track of each was erratic and the drift speeds generally less than 0.20 m/s. The icebergs initially located along the coast of Baffin Island followed the prevailing currents southward. These icebergs drifted at speeds as high as 0.8 m/s with model speeds generally falling between 0.10 m/s and 0.20 m/s. Groundings occurred frequently occupying 40 percent of the observed time. Data processing methods, accuracy of the ice buoy system, and a detailed analysis of each iceberg's drift is presented. It was estimated using the drift data obtained, that approximately 190 days are needed for an average size iceberg to travel the 1100 nautical miles from Cape Dyer, Baffin Island, to the outer limits of the Grand Banks of Newfoundland. GRA

N80-10584# Oak Ridge National Lab., Tenn.

COMPUTER SOFTWARE TO CALCULATE AND MAP *GEOLOGIC PARAMETERS REQUIRED IN ESTIMATING* COAL PRODUCTION COSTS Final Report

R. B. Honea, C. H. Petrich, D. L. Wilson, C. A. Dillard, R. C. Durfee, and J. A. Faber (Denison Univ.) Apr. 1979 124 p refs Sponsored in part by Electric Power Research Inst.

(Contract W-7405-eng-26; EPRI Proj. 804)

(EPRI-EA-674) Avail: NTIS HC A06/MF A01

A general overview of the software and methodology developed to calculate parameters such as surface slope and coal seam thickness and depth is provided along with sample map output which indicates the geographical distribution of these geologic characteristics. A user guide for implementing the software is included. Coal production, coal recovery, and coal resource calculation studies are reviewed. This system will be useful to utilities and coal mine operators alike in estimating costs through comprehensive assessment before mining takes place. DOE

N80-10585# Argonne National Lab., Ill.

MINERAL RESOURCES AND LAND-USE PLANNING, THE WATKINS, COLORADO CASE: A WORKSHOP SYNOPSIS

James R. LaFevers, Allen B. Agnew (USGS, Reston, Va.), Gail Hill (Denver Regional Council of Governments, Colo.), and J. Lee Guernsey Sep. 1978 46 p

(Contract W-31-109-ENG-38)

(ANL/LRP/TM-7) Avail: NTIS HC A03/MF A01

The reclamation and land use planning, program, which provides guidance materials and technical services to mining industry and public sector planners concerned with planning for effective land use in surface mine areas, is described. The program integrates reclamation planning with land use planning to assure maximum benefits to the public from both the reuse of mined areas and the efficient utilization of surface resources. Issues of critical importance relating to the potential development of lignite deposits in the vicinity of Denver, Colorado are discussed in detail. DOE

N80-10586# Oak Ridge National Lab., Tenn.

COMPUTER MAPPING SOFTWARE AND GEOGRAPHIC DATA BASE DEVELOPMENT: OAK RIDGE NATIONAL LABORATORY USER EXPERIENCE

Bob Honea and P. Johnson 28 Jul. 1978 35 p refs Presented at Conf. on Computer Mapping Software and Data Bases, Cambridge, Mass., 26 Jul. 1978

(Contract W-7405-ENG-26)

(Conf-780727-1) Avail: NTIS HC A03/MF A01

Computer graphic techniques developed for the sake of the computer graphics community tend to be esoteric and rarely suitable for user problems. Two types of users exist for computer graphic tools: the researcher who is generally satisfied with abstract but accurate displays for analysis purposes and the decision maker who requires synoptic and easily comprehended displays relevant to the issues he or she must address. Computer mapping software and data bases should be developed for the user in a generalized and standardized format for ease in transferring and to facilitate the linking or merging with larger analysis systems. Maximum utility of computer mapping tools is accomplished when linked to geographic information and analysis systems. Computer graphic techniques have varying degrees of utility depending upon whether they are used for data validation, analysis procedures or presenting research results. DOE

N80-10587# Hawaii Ad Hoc Committee on Remote Sensing, Honolulu.

LANDSAT PROJECT, STATE OF HAWAII: A PRELIMINARY REPORT

Dec. 1978 41 p

(PB-296712/3; NOAA-79050811) Avail: NTIS HC A03/MF A01 CSCL 13B

The past, present and potential future application of satellite remote sensing technology is examined as a possible means for meeting growing land use and environment-related information needs of the State of Hawaii. GRA

N80-10588# New Mexico Univ., Albuquerque. Technology Application Center.

REMOTE SENSING APPLIED TO AGRICULTURAL RESOURCES. *CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE* Progress Report, 1974 - Jun. 1979

Gerald F. Zollars Jul. 1979 48 p

(NTIS/PS-79/0733/0) Avail: NTIS HC $28.00/MF $28.00 CSCL 02D

This bibliography cites 193 articles from the international literature concerning remote sensing applications in the agricultural sector. The use of remote sensors for soil and vegetation mapping.

soil moisture mapping, and the interpretation of agricultural land use is stressed. GRA

N80-10589# Purdue Univ., Lafayette, Ind. Water Resources Research Center.
SOME STEADY STATE EXACT SOLUTIONS OF THE WIND-DRIVEN CIRCULATION EQUATIONS FOR A RIGID-LID SHALLOW LAKE
Aldo Giorgini Jun. 1979 63 p refs Sponsored by the Dept. of Interior
(PB-297206/5; TR-116; W79-07425; OWRT-A-048-IND(1))
Avail: NTIS HC A04/MF A01 CSCL 08H

A method is presented for solving the lake circulation equations under the rigid-lid approximation and for small shallow lakes. The driving force, simulating the wind, is constituted by a one-directional shear whose intensity may be variable across the lake. The method relaxes the bathymetry as a datum and finds it instead, together with the flow field, by suitable constraints on the flow field itself. The most interesting case of uniform surface shear (uniform wind intensity) is studied for the following subcases: a lake; and underwater hill in an otherwise constant-depth water body of infinite horizontal extend, and an underwater pool in an otherwise constant-depth water body of infinite horizontal extent. GRA

N80-10590# University of Eastern Michigan, Ypsilanti. Dept. of Geography and Geology.
IMPACT OF GREAT LAKES WATER LEVEL FLUCTUATIONS ON COASTAL WETLANDS Final Report, 1 Oct. 1976 - 30 Nov. 1978
Eugene Jaworski, C. Nicholas Raphael, P. J. Mansfield, and Brooks B. Williamson Apr. 1979 364 p refs
(Contract DI-14-0001-7163)
(PB-296403/9; W79-07001; OWRT-B-045-MICH(1)) Avail: NTIS HC A16/MF A01 CSCL 08H

Field measurements were collected at seven study areas along Lakes Michigan, Huron, St. Clair, and Erie. Surface landforms were mapped and models of the four coastal wetland types were developed. With the aid of aerial photography and field bisects, the zonal plant communities were identified and three historical distribution maps were constructed which represented various lake level conditions. Field data indicate that water level, wave energy, and substrate type are important factors in determining the shifting of plant communities in response to lake level fluctuations. GRA

N80-10591# Washington Univ., Seattle. Hydraulics Lab.
HYDROLOGIC MODELING AND DATA REQUIREMENTS FOR ANALYSIS OF URBAN STREAMFLOW MANAGEMENT ALTERNATIVES
Gary J. Kemp and Stephen J. Burges Nov. 1978 134 p refs
(Contract DI-14-34-0001-8051)
(PB-296499/7; TR-57; W79-07004; OWRT-A-092-WASH(1))
Avail: NTIS HC A07/MF A01 CSCL 08H

The development of evaluative criteria for use of continuous simulation hydrologic models is presented for King and Snohomish Counties, Washington. From the examination of the general characteristics of several continuous simulation models it was found that variations of the Stanford University Model (SWM) were the only models possessing the desired characteristics. These are evaluated in detail as a group. It is concluded that the SWM provides better information than more commonly used methods. The Hydrocomp Simulation Processor II is recommended for implementation as the model best suited for this specific location. Its primary limitation is its demand for data, particularly rainfall records, and the associated cost of data development and handling. GRA

N80-10592# West Virginia Univ., Morgantown. Thermal-Hydraulics Lab.
INFLUENCE OF PUMPED STORAGE FLOWS ON THERMAL STRATIFICATION IN RESERVOIRS Final Report
V. Singh, R. A. Bajura, and S. H. Schwartz Jan. 1979 170 p refs
(Contract DI-14-34-0001-6214)
(PB-297131/5; VS/RAB/SHS-79-1; RR-10; W79-07365)
Avail: NTIS HC A08/MF A01 CSCL 13B

The characteristics of buoyant submerged horizontal jets which simulate the discharge from power plants were found to be dependent upon the Froude number and the jet and ambient water temperatures. The concentration of salt solutions used to simulate the buoyancy mechanism in some of the tests was observed to alter the mixing characteristics of the jets. A series of tests was conducted to determine the mixing which would occur in two tanks simulating a pumped storage reservoir system after a number of cycles of operation. The mixing in the reservoirs was also simulated using a numerical computational scheme in two dimensions. The numerical predictions were in qualitative agreement with the experimental results. GRA

N80-10594# Joint Publications Research Service, Arlington, Va.
LODGING OF GRAIN CROPS AND ITS DETECTION BY AERIAL PHOTOGRAPHY
V. Ye. Budanov (All-Union Scientific Res. Inst. of Cybernetics) In its USSR Report: Biomedical and Behavioral Sci., No. 112 23 Jul. 1979 p 1-6 Transl. into ENGLISH from Zashchita Rasteniy (Moscow), no. 4, 1979 p 32-33 (For primary document see N80-10993 01-99)
Copyright. Avail: NTIS HC A06/MF A01

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N80-10593 *Drexel Univ., Philadelphia, Pa.*
OPTIMAL CONTROL OF DISTRIBUTED PARAMETER SYSTEMS FOR SOLAR THERMAL APPLICATIONS Ph.D. Thesis
Abraham Orbach 1979 252 p
Avail: Univ. Microfilms Order No. 7923085

The necessary conditions for optimality, which generate a set of equations whose solution yields the optimal control, were derived. It was shown that if the system and the performance index were bilinear and if the control vector was constrained, the optimal solution yielded a bang-bang policy for which the switching functions were obtained. These results were applied to the optimal control of the solar collector loop systems where the objective was to control the fluid velocity so as to maximize the net energy collected. A sensitivity study of a nonlinear first order in time and space system is presented. Three types of distributed parameter models, which represent the dynamics of the flat plate solar collector were derived. Dissert. Abstr.

N80-10594*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SOME TECHNIQUES FOR REDUCING THE TOWER SHADOW OF THE DOE/NASA MOD-0 WIND TURBINE TOWER Final Report
Richard R. Burley, Joseph M. Savino, Lee H. Wagner, and James H. Diedrich Sep. 1979 129 p refs
(Contract DE-AB29-76-ET20370)
(NASA-TM-79202; DOE/NASA/20370-79/17; E-087) Avail: NTIS HC A07/MF A01 CSCL 10B

Wind speed profile measurements to measure the effect of a wind turbine tower on the wind velocity are presented. Measurements were made in the wake of scale models of the tower and in the wake of certain full scale components to determine the magnitude of the speed reduction (tower shadow). Shadow abatement techniques tested on the towers included the removal of diagonals, replacement of diagonals and horizontals with round cross section members, installation of elliptical shapes on horizontal members, installation of airfoils on vertical members, and application of surface roughness to vertical members. A.W.H.

N80-10595*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NASA-LEWIS CLOSED-CYCLE MAGNETOHYDRODYNAMICS PLANT ANALYSIS

Paul F. Penko 1979 13 p refs Presented at Closed-Cycle Magnetohydrodynamics Specialists Meeting, Bozeman, Montana, 21 Jun. 1979

(Contract EF-77-A-01-2674)

(NASA-TM-79249; DOE/NASA-2674-79/7; E-159) Avail: NTIS HC A02/MF A01 CSCL 10A

A brief review of preliminary analyses of coal fired closed cycle MHD power plants is presented. The performance of three power plants with differing combustion systems were compared. The combustion systems considered were (1) a direct coal-fired combustor, (2) a coal gasifier with in-bed desulfurization and (3) a coal gasifier requiring external fuel gas cleanup. Power plant efficiencies (auxiliary power excluded) were 44.5, 43, and 41 percent for the three plants, respectively. R.E.S.

N80-10596# General Electric Co., Schenectady, N. Y. Energy Systems Programs Dept.

THE FIRST SMALL POWER SYSTEM EXPERIMENT, PHASE 1: ENGINEERING EXPERIMENT NO. 1 Final Report, 5 Jul 1978 - 4 May 1979

H. E. Jones et al 1978 570 p Prepared for JPL

(Contract JPL-955116)

(NASA-CR-162417) Avail: NTIS HC A25/MF A01 CSCL 10A

Conceptual designs were generated for several small solar thermal electric power plant configurations with a nominal size of one MWe and 0.4 annual capacity factor. Three startup times for a near term engineering experiment were considered for an application involving a small community and utility system. System characteristics, performance, and costs were determined for the nominal size plants. Size variations of from 0.5 to 10 MWe and from zero storage capacity to 0.7 annual capacity factor were evaluated with respect to cost and performance impact. Basic design goals for all the near term systems were: (1) high operational reliability; (2) minimum risk of failure; (3) commercial potential; and (4) low total experiment cost. K.L.

N80-10597*# SRI International Corp., Menlo Park, Calif.

NOVEL DUPLEX VAPOR: ELECTROCHEMICAL METHOD FOR SILICON SOLAR CELLS Quarterly Progress Report, 1 May - 31 Jul. 1979

L. Nanis, A. Sanjurjo, and K. Sancier 31 Aug. 1979 21 p Prepared for JPL

(Contracts NAS7-100; JPL-954471; SRI Proj. PYU-4980)

(NASA-CR-162387; DOE/JPL-954471-79/11; QPR-14) Avail: NTIS HC A02/MF A01 CSCL 10A

The scaled up chemical reactor for a SiF4-Na reaction system is examined for increased reaction rate and production rate. The reaction system which now produces 5 kg batches of mixed Si and NaF is evaluated. The reactor design is described along with an analysis of the increased capacity of the Na chip feeder. The reactor procedure is discussed and Si coalescence in the reaction products is diagnosed. A.W.H.

N80-10598*# Crystal Systems, Inc., Salem, Mass.

SILICON INGOT CASTING HEAT EXCHANGER METHOD, MULTI-WIRE SLICING, FIXED ABRASIVE SLICING TECHNIQUE, PHASE 3 Quarterly Progress Report, 1 Apr. - 30 Jun. 1979

Frederick Schmid and Chandra P. Khattak Jul. 1979 34 p refs Sponsored by NASA and DOE Prepared for JPL

(Contract JPL-954373)

(NASA-CR-162398; DOE/JPL-954373-79/11; QPR-3) Avail: NTIS HC A03/MF A01 CSCL 10A

Ingot casting was scaled up to 16 cm x 16 cm square cross section size weighting up to 8.1 kg. The high degree of crystallinity was maintained in the large ingot. For large sizes, the non-uniformity of heat treatment caused 'chipping' of the surface of the ingot. Significant effort and progress was made in the development of a uniform graded structure in the silica crucibles. The high speed slicer was modified so that the bladehead weight was reduced to 37 pounds. This allowed for higher surface speeds of up to 500 feet per minute. Slicing of 10 cm diameter workpieces at these speeds increased the throughput of the machine to 5.7 mils/min., 0.145 mm/min., 50 per cent more than the projected cutting rates used in the economic analysis. R.E.S.

N80-10599# Committee on Science and Technology (U. S. House).

PASSIVE SOLAR ENERGY PROGRAMS AND PLANS

Washington GPO 1978 432 p Hearing before the Subcomm. on Advanced Energy Technologies and Energy Conservation Res., Development and Demonstration of the Comm. on Sci. and Technol., 95th Congr., 2d Sess., 19 Sep. 1978

(GPO-36-211) Avail: Subcomm. on Advanced Energy Technologies and Energy Conservation Res., Development and Demonstration

Testimony delivered and statements received regarding passive solar energy systems development under the Solar Heating and Cooling Demonstration Act (PL 93-409) are presented. Basic approaches are described as well as the use of specific heat absorbing materials in building construction and the use of windows and baffles to control the amount of sunlight received. Additional research needs are examined. Market demand, technology transfer, and technology utilization are also considered. A.R.H.

N80-10600*# RCA Labs., Princeton, N. J. David Sarnoff Research Center.

ANALYSIS OF S-BAND SOLID-STATE TRANSMITTERS FOR THE SOLAR POWER SATELLITE Final Report, 1 Nov. 1978 - 1 Jun. 1979

E. F. Belohoubek, M. Ettenberg, H. C. Huang, M. Nowogrodzki, and F. N. Sechi 1 Jun. 1979 79 p refs

(Contract NAS9-15755)

(NASA-CR-160320) Avail: NTIS HC A05/MF A01 CSCL 10A

The possibility of replacing the Reference System antenna in which thermionic devices are used for the dc-to-microwave conversion, with solid-state elements was explored. System, device, and antenna module tradeoff investigations strongly point toward the desirability of changing the transmitter concept to a distributed array of relatively low power elements, deriving their dc power directly from the solar cell array and whose microwave power outputs are combined in space. The approach eliminates the thermal, weight, and dc-voltage distribution problems of a system in which high power tubes are simply replaced with clusters of solid state amplifiers. The proposed approach retains the important advantages of a solid state system: greatly enhanced reliability and graceful degradation of the system. A.R.H.

N80-10601*# Honeywell, Inc., Minneapolis, Minn.

OCMULGEE NATIONAL MONUMENT VISITOR CENTER SOLAR HEATING AND COOLING SYSTEM DESIGN REVIEW DATA

May 1978 72 p refs Prepared for NASA and DOE

(Contract NAS8-32093)

(NASA-CR-150706) Avail: NTIS HC A04/MF A01 CSCL 10A

The design of a solar heating and cooling system is documented. Solar collectors, design approaches, system trade studies, and preliminary specifications are discussed. K.L.

N80-10602*# Honeywell, Inc., Minneapolis, Minn. Energy Resources Center.

SOLAR HEATING AND COOLING SYSTEMS DESIGN AND DEVELOPMENT Quarterly Report, 9 Jul. - 9 Oct. 1978

Oct. 1978 81 p Prepared for DOE

(Contract NAS8-32093)

(NASA-CR-150618; HONEYWELL-F3437-QR-101) Avail: NTIS HC A05/MF A01 CSCL 10A

Solar heating and heating/cooling systems were designed for single family, multifamily, and commercial applications. Subsystems considered included solar collectors, heat storage systems, auxiliary energy sources, working fluids, and supplementary controls, piping, and pumps. K.L.

N80-10603*# Energy Research Corp., Danbury, Conn.

TECHNOLOGY DEVELOPMENT FOR PHOSPHORIC ACID FUEL CELL POWERPLANT, PHASE 2 Quarterly Report

Larry Christner Jun. 1979 72 p Prepared for DOE

(Contract DEN3-67)
(NASA-CR-159705; DOE/NASA/0067-79-2; QR-3) Avail: NTIS HC A04/MF A01 CSCL 10A

A technique for producing an acid inventory control member by spraying FEP onto a partially screened carbon paper backing is discussed. Theoretical analysis of the acid management indicates that the vapor composition of 103% H_3PO_4 is approximately 1.0 ppm P4010. An SEM evaluation of corrosion resistance of phenolic resins and graphite/phenolic resin composites in H_3PO_4 at 185 C shows specific surface etching. Carbonization of graphite/phenolic bipolar plates is achieved without blistering. K.L.

N80-10604*# University of Western Kentucky, Bowling Green.
MSFC SOLAR HEATING AND COOLING HIGH SPEED PERFORMANCE (HISPER) CODE VALIDATION *Final Report*
Henry M. Healey 12 Oct. 1979 15 p
(Contract NAS8-33387)
(NASA-CR-161323) Avail: NTIS HC A02/MF A01 CSCL 10A

The status of the Solar Heating and Cooling Project is reported. Modifications to the HISPER program are outlined, and recommendations concerning the validation study of HISPER are included. F.O.S.

N80-10605# Westinghouse Electric Corp., Eddystone, Pa.
SCREENING EVALUATION OF NOVEL POWER CYCLES INTEGRATED WITH GASIFICATION PLANTS *Final Report*
R. W. Foster-Pegg and R. V. Garland Feb. 1979 136 p
(Contract EPRI Proj. 990-3)
(EPRI-AF-1002) Avail: NTIS HC A07/MF A01

Three basic plant configurations were studied: (1) the condensing combined cycle, which includes combustion turbines, gas expanders and condensing steam turbines; (2) the single cycle, which is comprised of combustion turbines and gas expanders, but no steam turbines; and (3) the noncondensing combined cycle, which utilizes combustion turbines, gas expanders and a non-condensing steam turbine. The most efficient plant configuration studied included a non-condensing steam turbine. The best plant heat rate calculated for this configuration is 7956 Btu/Kwh. DOE

N80-10606# Argonne National Lab., Ill. Materials Science Div.
MATERIALS TESTING FOR CENTRAL RECEIVER SOLAR-THERMAL POWER SYSTEMS
S. Majumdar 1979 14 p
(Contract W-31-109-eng-38)
(DOE/TIC-10103) Avail: NTIS HC A02/MF A01

The determination of specific elevated temperature mechanical properties of materials used for critical components in solar control receiver power systems is described. The biaxial creep fatigue testing of type 316H stainless steel superheater tubing is discussed. A survey of sodium effects on candidate materials for solar-thermal electric piping and steam generators is presented. The mechanical properties data generation is evaluated. DOE

N80-10607# Department of Energy, Washington, D. C. Energy Information Administration.
ECONOMIC STRUCTURE, AGGREGATE PRODUCTION FUNCTIONS AND THE DEMAND FOR ENERGY AS AN INTERMEDIATE PRODUCT: A PRELIMINARY ANALYSIS
G. M. Lady Dec. 1978 57 p refs
(DOE/EIA-0103/8) Avail: NTIS HC A04/MF A01

The relationship between the price elasticity of demand for energy as a factor of production and differences in economic structure was investigated. A model of general economic equilibrium is constructed utilizing a constant-elasticity-of-substitution production function. Using this model the price elasticity of demand for an intermediate product (energy) is determined under alternative structural assumptions (i.e., the degree to which the production process for the intermediate product directly utilizes primary factors of production). For an open economy and the case of energy, these assumptions could concern the degree to which the economy utilizes its own versus imported energy resources. DOE

N80-10608# Sandia Labs., Albuquerque, N. Mex.
DISPERSED POWER SYSTEMS AND TOTAL ENERGY
V. L. Dugan Nov. 1978 3 p Presented at AIAA Conf. on Solar Energy, Phoenix, Ariz., 27 Nov. 1978
(Contract EY-76-C-04-0789)
(SAND-78-2006C; Conf-781133-3) Avail: NTIS HC A02/MF A01

The variations of solar systems considered for dispersed applications are defined, and their relative benefits and costs are examined. Also, the role and benefits of total energy systems in dispersed applications are discussed. Although dispersed solar power systems offer large stored energy multiplication factors, they exhibit a large materials and land dependency. The importance of using most plentiful and available materials and planning a recycling materials use strategy are emphasized. DOE

N80-10609# Sandia Labs., Albuquerque, N. Mex.
SAFETY AND ENVIRONMENTAL IMPLICATIONS DOE/SANDIA MIDTEMPERATURE SOLAR SYSTEMS TEST FACILITY
J. A. Leonard Nov. 1978 7 p Presented at Environ. Control Symp., Washington, D.C., 28 Nov. 1978
(Contract EY-76-C-04-0789)
(SAND-78-2292C; Conf-781109-8) Avail: NTIS HC A02/MF A01

The Midtemperature Solar Systems Test Facility (MSSTF) in Albuquerque, New Mexico, is presented. The MSSTF is, at 32 kWe, the largest solar electric power plant in the U.S. and also represents the world's first application of the solar total energy concept to an actual load, an 1100 sq m office building. DOE

N80-10610# Booz-Allen and Hamilton, Inc., Bethesda, Md.
EPRI NEW ENERGY RESOURCES DEPARTMENT STRATEGY PAPER *Final Report, Jan. 1979*
Michael Lotker 1979 114 p
(EPRI-ER-979) Avail: NTIS HC A06/MF A01

The rationale for national and utility industry involvement in new energy resources (NER) technology is presented. The procedures currently being used to formulate programs in each of the NER technologies are described. DOE

N80-10611# California Univ., Berkeley. Lawrence Berkeley Lab.
ANOTHER LOOK AT ENERGY CONSERVATION
L. Schipper 1978 24 p refs Presented at Amer. Econ. Assoc., Chicago, 30 Aug. 1978
(Contract W-7405-eng-48)
(LBL-7893; Conf-7808104-1) Avail: NTIS HC A02/MF A01

The need for energy conservation in U.S. buildings, industry and the transportation sector, the effects of the amount and cost of energy supplies on energy conservation, and goals of a national energy policy are discussed. DOE

N80-10612# System Development Corp., Santa Monica, Calif.
THE 10MW(e) SOLAR THERMAL CENTRAL RECEIVER PILOT PLANT: HELIOSTAT FOUNDATION AND INTERFACE STRUCTURE INVESTIGATION
R. K. Shogren and J. T. Phillips 28 Aug. 1978 87 p refs Sponsored by Sandia Labs.
(Contract EY-76-C-04-0789)
(SAND-78-8180) Avail: NTIS HC A05/MF A01

Foundation design requirements for heliostats for the 10 MWe Solar Thermal Power Plant (STPP) were investigated. Soils data were reviewed and a soils investigation specification and recommendations were prepared as required. Foundation to collector interface requirements were studied. Candidate foundation designs were prepared with associated cost studies. Grading requirements recommendations consistent with technical and budgetary restrictions, and recommendations for construction and test of prototype foundations were developed. DOE

N80-10613# Battelle Pacific Northwest Labs., Richland, Wash.
SUMMARY REPORT OF THE SOLAR REFLECTIVE MATERIALS TECHNOLOGY WORKSHOP
M. A. Lind and L. E. Ault Oct. 1978 93 p Workshop held at Denver, 28-30 Mar. 1978
(Contract EY-76-C-06-1830)

(PNL-2783; Conf-780390) Avail: NTIS HC A05/MF A01

Solar reflector materials technology was assessed. Metals, metallic films and alloys, and dielectric or ceramic stacks were considered as reflecting surface materials. Protective coatings discussed included polymer paints and films, inorganic coatings, and thin glass. The mirror support structures considered were polymer foams, cellular glass, aluminum honeycomb, wood, and fiberglass and epoxy composites. The requirements and properties for reflector materials were discussed along with environmental tests and actual field experiences with solar collector structures. High concentration ratio and central receiver concepts were emphasized. K.L.

N80-10614# Hanford Engineering Development Lab., Richland, Wash.

ACID DIGESTION OF COMBUSTIBLE WASTE Status Report

C. Allen, R. Cowan, and J. Divine Oct. 1978 124 p refs

(Contract EY-76-C-14-1270)

(HEDL-TME-78-77; SR-2) Avail: NTIS HC A06/MF A01

The radioactive acid digestion test unit (RADTU), which was constructed to process combustible transuranic waste, is presented. Laboratory testing, pilot plant testing, engineering studies, and safety studies were completed and incorporated in the system design. DOE

N80-10615# AiResearch Mfg. Co., Phoenix, Ariz.

BRAYTON ISOTOPE POWER SYSTEM, PHASE 1 Final Report

28 Jul. 1978 124 p

(Contract EY-76-C-03-1123)

(TID-28927) Avail: NTIS HC A06/MF A01

A closed gas turbine dynamic power conversion system to be used for space applications is presented. A conceptual design of the flight system is presented and the design, development, and test of a prototype demonstration system are described. When tested, the system showed 25 percent conversion efficiency and 1000 hours of endurance testing. R.E.S.

N80-10616# Combustion Engineering, Inc., Windsor, Conn. Power Systems Group.

MDAC/ROCKETDYNE SOLAR RECEIVER: DESIGN REVIEW

H. M. Payne Aug. 1978 130 p refs

(Contracts EY-76-C-04-0789; AT(29-1)-789)

(SAND-78-8188; ASA-78-06) Avail: NTIS HC A07/MF A01

The adequacy of the design in meeting the requirements of the solar central receiver (boiler) over a commercial lifetime of 30 years was assessed for an external solar heated receiver, composed of a multiple of modular panels arranged in parallel and operating on the once-through steam generation principle. Each panel is composed of welded tangent tubes, connected between inlet and outlet headers. Subcooled water enters the bottom headers, flows upward, absorbs heat, produces saturated steam throughout the two phase region, and exits at the top as superheated steam. Tube size and material are the same for both commercial and pilot plants. Panel sizes are different between the two plants. Commercial plant heat flux is approximately 2.8 times that of the pilot plant. Structural supports and attachments of both designs are similar. Control of final superheat temperature is maintained by varying the water flow to each of the panels, according to the thermal absorption of each panel. DOE

N80-10617# Department of Energy, Oak Ridge, Tenn. Technical Information Center.

ENERGY INFORMATION DATA BASE. CORPORATE AUTHOR ENTRIES Progress Report, Jun. 1978 - Mar. 1979

Mar. 1979 40 p

(DOE/TIC-4585-R1-Suppl-1) Avail: NTIS HC A03/MF A01

This supplement contains additions to TID-4585-R1 and is intended to be used with that publication. Future supplements will be cumulative from June 1978 until another revision is issued. DOE

N80-10618# Department of Energy, Washington, D. C.

NATIONAL ENERGY PLAN 2

1979 355 p

(DOE/TIC-10109) Avail: NTIS HC A16/MF A01

The Administration's second National Energy Plan is presented. The past, present, and future of energy supply and demand for the U.S. is discussed. DOE

N80-10619# California Univ., Livermore. Lawrence Livermore Lab.

ENERGY TRANSITION IN CALIFORNIA

M. N. Christensen 1979 25 p refs

(Contract W-7405-eng-48)

(UCRL-15003) Avail: NTIS HC A02/MF A01

Major elements of consensus within current energy debates are discussed. Implications of that consensus for development of large scale supply facilities, decisions by end-users of energy, and prospects for future demands for energy are also discussed. Events and circumstances in California are focused but relevant information from other places is also used. DOE

N80-10620# Department of Energy, Washington, D. C.

ENERGY SUPPLY AND DEMAND IN THE MIDTERM: 1985, 1990, AND 1995 Analysis Report

Apr. 1979 223 p

(DOE/EIA-0102/52) Avail: NTIS HC A10/MF A01

To account for the uncertainty inherent in projecting future energy production, consumption, prices, and associated variables, five basic projection series (A-E) are presented. These series constitute variations in assumptions influencing energy supply and demand curves. High demand is assumed for Series A and B, and low demand is assumed for D and E. High supply is assumed for Series A and D, and low supply is assumed for Series B and E. Series C assumes medium supply and demand. Two additional scenarios, C High and C Low, evaluate the sensitivity of the Series C forecasts to variations in the projected world of oil price. A computer model, called the 'midterm energy forecasting system', simulates the interactions of energy suppliers and consumers in the marketplace. DOE

N80-10621# California Univ., Berkeley. Lawrence Berkeley Lab.

ENERGY CONSERVATION AND THE ENVIRONMENT: CONFLICT OR COMPLEMENT

L. Schipper Sep. 1978 84 p refs Presented at Conf. on Impacts and Risks of Energy Strategies, Stockholm, Sweden, Sep. 1978 and the Environmental Secretariate, Organization for Economic Cooperation and Development, Paris, Oct. 1978

(Contract W-7406-eng-48)

(LBL-7882; Conf-7809141-1; Conf-7810167-1) Avail: NTIS HC A05/MF A01

The relationship among energy, the environment, and economic well-being is discussed. The confusing aspects were sorted out in order to show how goals relating to the efficient use of energy are aligned both with traditional economic goals and with modern environmental goals. The role of energy in the economy was analyzed and the origins of many of the misconceptions about that role were traced. DOE

N80-10622*# General Electric Co., Schenectady, N. Y.

CONCEPTUAL DESIGN OF THERMAL ENERGY STORAGE SYSTEMS FOR NEAR-TERM ELECTRIC UTILITY APPLICATIONS. VOLUME 2: APPENDIXES, SCREENING OF CONCEPTS

W. Hausz, B. J. Berkowitz, and R. C. Hare Apr. 1979 151 p refs

(Contract EC-77-A-31-1034; EPRI Proj. 1082-1)

(NASA-CR-159411; EPRI-EM-1037-Vol-2) Avail: NTIS HC A08/MF A01

Volume two contains three appendices entitled: (1) Bibliography and Cross References; (2) Taxonomy: Proponents and Sources; and (3) Concept Definitions. DOE

N80-10623# California Univ., Livermore. Lawrence Livermore Lab.

METHODS OF ESTIMATING THE RELIABILITY OF WIND ENERGY SYSTEMS WITH STORAGE

C. R. Glassey and G. F. Moyer 1978 61 p refs

(Contract W-7405-eng-48)

(UCRL-15005) Avail: NTIS HC A05/MF A01

Some preliminary results obtained in analyzing the reliability of wind generator storage systems are presented. The investigation took two separate approaches, simulation and probabilistic modeling, to reveal the trade-offs which can be made between generating capacity and storage capacity to attain a desired level of reliability. The performance criterion used throughout this work was the frequency of occurrence of empty storage. This criterion was essentially the same as the frequency of loss of load. DOE

N80-10624# Brookhaven National Lab., Upton, N. Y.
SOLAR ASSISTED HEAT PUMP OVERVIEW AND SUMMARY OF IN-HOUSE RESEARCH
John W. Andrews Sep. 1978 5 p refs Presented at the 3rd Ann. Solar Heating and Cooling R and D Contractors' Meeting, Washington, D.C., 24 Sep. 1978
(Contract EY-76-C-02-0016)
(BNL-24911; Conf-780983-2) Avail: NTIS HC A02/MF A01

The following areas of solar assisted heat pump research and development are overviewed: (1) development of special heat pump tuned to take advantage of the 40 to 100 F source temperature range appropriate for solar assist; (2) identification of low cost, solar energy collection and storage subsystems appropriate for the solar assist function; and (3) analysis of solar assisted heat pump systems to determine what component parameters are required to produce economically competitive systems. DOE

N80-10625# Battelle Pacific Northwest Labs., Richland, Wash.
METHODOLOGY FOR IDENTIFYING MATERIALS CONSTRAINTS TO IMPLEMENTATION OF SOLAR ENERGY TECHNOLOGIES
J. W. Litchfield, R. L. Watts, W. E. Gurwell, J. N. Hartley, and C. H. Bloomster Jul. 1978 91 p refs
(Contract EY-76-C-06-1830)
(PNL-2711) Avail: NTIS HC A05/MF A01

A materials assessment methodology for identifying specific critical material requirements that could hinder the implementation of solar energy was developed and demonstrated. The methodology involves an initial screening process, followed by a more detailed materials assessment. The detailed assessment considers such materials concerns and constraints as process and production constraints, reserve and resource limitations, lack of alternative supply sources, geopolitical problems, environmental and energy concerns, time constraints, and economic constraints. Data for 55 bulk and 53 raw materials required in the example photovoltaic systems are available on the data base. Engineering and bulk material requirements were defined for one photovoltaic system, thirteen photovoltaic cells, ten solar heating and cooling systems, and two agricultural and industrial process heat systems. DOE

N80-10626# Sandia Labs., Albuquerque, N. Mex.
SENSITIVITY STUDY OF BRAYTON CYCLE POWER PLANT PERFORMANCE
Carl C. Hiller Aug. 1978 36 p refs
(Contract EY-76-C-04-0789)
(SAND-78-8020) Avail: NTIS HC A03/MF A01

The efficiency of Brayton cycle power plants is investigated. The parameters and configurations examined include open and closed air cycles, optimum pressure ratio, helium versus air working fluids, turbine and compressor isentropic efficiencies, recuperator effectiveness, turbine inlet temperature, heat rejection temperature, pressure drop losses, with/without intercooling, and with/without reheat. Equation derivations, a computer listing, and a hand calculator program listing are included. DOE

N80-10627# Oak Ridge National Lab., Tenn.
SURVEY OF SOLAR THERMAL ENERGY STORAGE SUBSYSTEMS FOR THERMAL/ELECTRIC APPLICATIONS
C. L. Segaser Aug. 1978 101 p refs
(Contract W-7405-eng-26)
(ORNL/TM-5758) Avail: NTIS HC A06/MF A01

The technology and estimated costs of subsystems for storing the thermal energy produced by solar collectors are discussed. The systems considered are capable of producing both electricity and space conditioning for a single family detached residence, an apartment complex of 100 units, and a city of 30,000 residents containing both single family residences and apartments. Up to 36 x 10 to the 5th power kWhr of thermal storage capacity is required. In addition to sensible heat and latent heat storage materials, several other media were investigated as potential thermal energy storage materials, including the clathrate and semiclathrate hydrates, various metal hydrides, and heat storage based on inorganic chemical reactions. DOE

N80-10628# Public Service Electric and Gas Co., Newark, N. J.
BATTERY ENERGY STORAGE TEST (BEST) FACILITY **Progress Report**
Emile A. Hyman Feb. 1979 94 p refs
(Contract EY-76-C-02-2857)
(EPRI-EM-1005; PR-1) Avail: NTIS HC A05/MF A01

The activities of the first three phases during the time period March 1, 1976 to July 1, 1978 are presented. Included are a background review, key milestone dates, a description of activities for the three phases (including those associated with the future implementation of the second test bay), and a description of major interactions between the BEST Facility program and the advanced battery development programs. DOE

N80-10629# Mitre Corp., McLean, Va. Metrek Div.
ENVIRONMENTAL DATA FOR ENERGY TECHNOLOGY POLICY ANALYSIS. VOLUME 1: SUMMARY
Jake Verhoeff, Robert Kline, William L. Parker, Thomas F. Wolfinger, David Adler (CONSAD Research Corp.), Gabriel Sucher (CONSAD Research Corp.), Marc Narkus-Kramer (International Research and Technology, Inc.), Nicklaus E. Leggett (International Research and Technology, Inc.), and Tyrone Williams (International Research and Technology, Inc.) Jan. 1979 106 p refs
(Contract EE-77-C-01-6119)
(HCP/EV6119-1) Avail: NTIS HC A06/MF A01

Qualitative and quantitative information on the environmental aspects of different energy technologies is provided. Data are given on nuclear energy, coal, synthetic fuels, oil shale, solar energy, geothermal energy, and hydroelectricity. Each category of technology is broken down into individual technology phases or base units for which environmental effects could reasonably be specified. Each base unit is described in terms of a typical unit or plant size and configuration. DOE

N80-10630# Department of Energy, Washington, D. C. Office of Program Coordinator.
COMPREHENSIVE ENVIRONMENT, HEALTH, AND SAFETY PROGRAM REPORT, FY 1978
Feb. 1979 67 p refs
(DOE/EV-0035) Avail: NTIS HC A04/MF A01

A description is given of the environment, health, and safety research, development, and demonstration activities carried out and in progress. Discussion is presented under the following section headings: a comprehensive environment, health, and safety program; concept and implementation approach; the DOE Office of Environmental - program and selected activities; environmental, health, and safety activities of other DOE offices; and, environmental, health, and safety activities of other Federal agencies. Titles of the four appendixes are: definition of research categories; summary of energy-related environment, health, and safety concerns; environment, health, and safety laws and regulations governing activities of the Department of Energy; and environmental, health, and safety activities of Federal agencies participating in the Federal Inventory. DOE

N80-10631# Department of Energy, Washington, D. C. Div. of Technology Assessments.
ENVIRONMENTAL READINESS OF EMERGING ENERGY TECHNOLOGIES **Summary Report**
Jan. 1979 77 p
(DOE/ERD-0022) Avail: NTIS HC A05/MF A01

The principal conclusions of the 21 Environmental Readiness Documents, which assessed 24 technologies are presented. Seven technologies were judged to have minimal environmental constraints. Four are solar technologies. The minimally constrained technologies nevertheless have some potential environmental, health, and safety problems, which will require careful management. Eleven technologies, many of which are high-technology systems with great promise for meeting the Nation's energy needs, were judged to have moderate environmental constraints.

The moderately constrained technologies are, with few exceptions, in the predemonstration stage, with demonstration and environmental readiness likely to be achieved by 1980-1990. Six technologies, enhanced oil recovery (micellar polymer), hydrothermal, coal gasification, coal liquefaction, diesel cogeneration, and in situ oil shale, were judged to have significant environmental constraints that will require extensive environmental research and development before they can be widely used or before they can be deployed in some environmentally sensitive areas. DOE

N80-10632# Argonne National Lab., Ill.
MODELING APPROACH SUITABLE FOR ENERGY SYSTEM
Dudley V. Goetschel 1979 8 p Presented at Pittsburg Modeling and Simulation Conf., Pittsburgh, 25-27 Apr. 1979
(Contract W-31-109-eng-38)
(Conf-790459-4) Avail: NTIS HC A02/MF A01

A nonlinear model that can be used in the formulation of certain energy conversion systems modeling problems is presented. The model lends itself nicely to solution approaches based on nonlinear programming algorithms and, in particular, to those methods falling into the class of variable metric algorithms for nonlinearly constrained optimization. DOE

N80-10633# Brookhaven National Lab., Upton, N. Y.
DYNAMICS AND CONTROL: ENERGY CONVERSION, DELIVERY, AND DEMAND ANALYSIS
Kenneth C. Hoffman Apr. 1979 22 p refs Presented at the Workshop on Process and Systems Dyn. Control, Denver, 20 Jun. 1979
(Contract EY-76-C-02-0016)
(BNL-26045; Conf-790636-1) Avail: NTIS HC A02/MF A01

Techniques of mathematical modeling and modern control theory, using microprocessors and advanced measurement and control devices, are extensively applied to components and systems for the conversion and delivery of energy. The projection of energy demands, as a function of economic growth and energy price, is also the subject of active research and analysis. This position paper reviews the current state-of-the-art of analysis in these areas dealing with the planning and operation of energy systems that deliver fuels and electric power. Future research directions are also discussed. DOE

N80-10634# RAND Corp., Santa Monica, Calif.
SOVIET ENERGY BALANCES
Robert Campbell Dec. 1978 115 p refs
(Contract EX-76-C-01-2337)
(RAND/R-2257-DOE) Avail: NTIS HC A06/MF A01

The pattern of energy flows in the Soviet economy contrasts sharply with that in the U.S. and in Western Europe. Today, the flow of energy exports in the USSR amounts to about 12% of Soviet primary energy production in 1975, whereas the U.S. and Western Europe must relay heavily on imports to augment domestic production. The composition of primary energy production in the USSR has changed considerably since 1950, when 80% was accounted for by solid fuel and only 18.5% by hydrocarbons. By 1975, hydrocarbons accounted for 64%, and the share for solid fuels had fallen to 33%. Since most Soviet energy exports have consisted of oil, the emphasis on solid fuels in consumption in the USSR is still higher than in production: solid fuels now represent 37% of consumption compared with 21% in Western Europe and 19% in the U.S. Within solid fuels, there is heavy reliance on relatively low-grade fuels: lignite, peat, oil shale, and firewood constituted nearly a third of Soviet solid fuel production in 1975. DOE

N80-10635# Washington Scientific Marketing, Inc., Washington, D. C.
***DEPARTMENT OF ENERGY WORKSHOPS ON INDUSTRIAL ENERGY CONSERVATION REPORTING* Final Report**
[1979] 190 p Workshops held at Washington, D. C., Atlanta, Houston, Tex., Chicago, New York, San Francisco, Nov. 1978 - Feb. 1979
(DOE/CS-1830-T3) Avail: NTIS HC A09/MF A01

A voluntary industrial energy-conservation program was initiated and now includes 50 trade organizations representing over 3,000 companies. Their current reporting system is an effort to respond to the Energy Policy and Conservation Act requirements, as now modified by the National Energy Conservation Policy Act. DOE's Office of Industrial Programs held six workshops in various key locations between November 1978 and February 1979 to enable energy managers to develop ideas and make suggestions that would improve the current and future energy-reporting programs. This report is a summary of the wide range of recommendations that the workshop participants offered as a means of meeting the NECPA requirements and the criticism of the current reporting program. It also reflects industry's views on potential approaches to future reporting. DOE

N80-10636# RAND Corp., Santa Monica, Calif.
RESOLVING ENVIRONMENTAL ISSUES IN ENERGY DEVELOPMENT: ROLES FOR THE DEPARTMENT OF ENERGY AND ITS FIELD OFFICES
Phyllis L. Ellickson and Edward W. Merrow Jan. 1979 62 p refs
(Contract EX-76-C-01-2337)
(RAND/R-2335-DOE) Avail: NTIS HC A04/MF A01

The role of the Department of Energy to resolve environmental conflicts that arise during the implementation of energy projects or programs was studied. The environmental concerns surrounding implementation and feasibility of national energy policies were also studied. The investigation reached the conclusion that the government's most effective role in resolving environmental conflicts and uncertainties is to improve communications among the concerned parties. This role requires flexibility and evenhandedness from the government as well as an understanding of the local conditions and a commitment to appropriate local solutions. Involving local sources at every stage of the environmental impact analysis can reduce the probability of conflicts and make those that do arise more easily resolvable. DOE

N80-10637# Los Alamos Scientific Lab., N. Mex.
SELECTED RESULTS FROM THE TECHNOLOGY ASSESSMENT OF SOLAR ENERGY PROGRAM
Milton C. Krupka and John H. Altseimer 1979 8 p refs Presented at AIAA Terrestrial Energy Systems Conf., Orlando, Fla., 4-6 Jun. 1979
(Contract W-7405-eng-36)
(LA-UR-79-950; Conf-790611-3) Avail: NTIS HC A02/MF A01

Emerging solar technologies and selected applications were studied from environmental, institutional and social viewpoints. The impacts resulting from the large scale deployment of decentralized solar technologies were assessed. Emphasis was placed upon technical characterization of the technology and the development of a representative model system for a given application upon which an environmental analysis could be made. DOE

N80-10638# Sandia Labs., Albuquerque, N. Mex.
ANALYTICAL EVALUATION OF A SOLAR THERMOPHOTOVOLTAIC (TPV) CONVERTER
Michael W. Edenburn 1979 5 p refs Presented at the International Solar Energy Society Meeting, Atlanta, 28 May 1979
(Contract EY-76-C-04-0789)
(SAND-79-0504C; Conf-790541-2) Avail: NTIS HC A02/MF A01

A thermophotovoltaic converter was parametrically analyzed for emitter temperature, cell reflectance to radiation with energy below the cell's bandgap energy and concentration ratio requirements. Important conclusions are: (1) an emitter temperature of 2000 K is optimal; (2) a cell reflectance value of 0.98 is required for below bandgap irradiation; (3) a secondary concentrator must be used with a parabolic dish primary; and (4) a mirror quality resulting in a 4 mrad reflection-beam dispersion is required for a 24% conversion efficiency. DOE

N80-10639# Lincoln Lab., Mass. Inst. of Tech., Lexington.
FLYWHEEL ENERGY STORAGE AND CONVERSION SYSTEM FOR SOLAR PHOTOVOLTAIC APPLICATIONS
Alan R. Millner 1979 9 p Presented at the ASME Gas Turbine Conf., San Diego, Calif., 12-15 Mar. 1979
(Contract EY-76-C-02-4094)
(COO-4094-31; Conf-790305-6) Avail: NTIS HC A02/MF A01

A low-drag, low-power magnetic bearing and a permanent magnet brushless DC motor-generator developed were developed for a satellite flywheel. These will be combined with a terrestrial flywheel and control electronics to make up a flywheel energy storage and conversion system for use in a stand-alone solar photovoltaic residence. Technical and economic performance analyses indicate that, contrary to general thought, a flywheel system will be competitive if not superior to more conventional systems utilizing either present day or advanced batteries. This derives from the ability of the flywheel to perform the functions of dc-to-ac inversion and optimal impedance matching between the PV arrays and the load in addition to providing energy storage. The structural topology, performance data, design parameters, and test measurements of the magnetic bearing and motor-generator are to be used as well as the flywheel and control electronics. A preliminary discussion of the economic aspects is also included. DOE

NBO-10640/ Sandia Labs., Albuquerque, N. Mex.
GRAPHICAL REPRESENTATION OF TMY SOLAR RADIATION AVAILABILITY FOR ONE- AND TWO-AXIS SOLAR COLLECTORS
L. L. Lukens and R. R. Peters May 1979 113 p refs
(Contract EY-76-C-04-0789)
(SAND-79-0418) Avail: NTIS HC A06/MF A01

Information about the availability of direct normal radiation to three tracking modes of concentrating collectors (two-axis, east-west, and north-south horizontal axis tracking collectors) for the 26 typical meteorological year stations is presented. The data presented include energy availability, efficiency based on the direct normal radiation availability, and energy distribution. DOE

NBO-10641/ Sandia Labs., Albuquerque, N. Mex.
STUDIES OF THE ABNORMALLY HIGH PEAK VOLTAGE OBSERVED WITH FeS2 DEPOLARIZED THERMAL BATTERIES
Samuel C. Levy and C. C. Crafts Apr. 1979 22 p refs
(Contract EY-76-C-04-0789)
(SAND-79-0090) Avail: NTIS HC A02/MF A01

Studies reported show that initial voltage spike occurring in FeS2 depolarized thermal batteries at low current densities is due to a surface impurity on the FeS2 particles. This impurity is the result of a reaction with atmospheric oxygen. Several techniques were developed for lowering the initial peak voltage spike and thereby attaining longer active lives to 75 or 80% of peak voltage cutoff. The most successful technique is to put a thin electrolyte-binder layer on the side of the cathode pellet contacting the collector. DOE

NBO-10642/ Sandia Labs., Albuquerque, N. Mex. Fluid and Thermal Sciences Dept.
NUMERICAL SIMULATION OF DUAL-MEDIA THERMAL ENERGY STORAGE SYSTEMS
R. J. Gross, C. E. Hickox, and C. E. Hackett 1979 38 p refs Presented at the 18th ASME Natl. Heat Transfer Conf., San Diego, Calif., Aug. 1979
(Contract EY-76-C-04-0789)
(SAND-78-2282C; Conf-790808) Avail: NTIS HC A03/MF A01

An easily implemented, finite difference predictor-corrector numerical technique is used to solve for fluid and solid temperature distributions in one dimensional flow through a finite packed bed. The method allows for temperature dependent properties, time varying inlet conditions, and nonuniform initial conditions. The numerical method agrees with the classical Schumann model to within one percent in simulations which exhibit fully developed thermal gradients of 310 C/m. Additional examples demonstrate that the technique is flexible and that the constant property assumption may lead to temperature distributions significantly different from a more realistic variable property assumption. The attractiveness of the method is its accuracy, flexibility, ease of implementation, and efficiency of computation. DOE

NBO-10643/ Rensselaer Polytechnic Inst., Troy, N. Y. Cogswell Lab.
PHYSICAL PROPERTIES DATA COMPILATIONS RELEVANT TO ENERGY STORAGE. 2. MOLTEN SALTS: DATA ON SINGLE AND MULTI-COMPONENT SALT SYSTEMS
G. J. Janz, C. B. Allen, N. P. Bansal, R. M. Murphy, and R. P. T. Tomkins Apr. 1979 440 p refs
(Contract W-7405-eng-48)
(NSRDS-NBS-61-Pt-2; LC-77-10824) Avail: NTIS HC A19/MF A01

The work provides selected data with value judgments for a set of 49 salt systems of interest as candidate materials for thermal energy storage sub-systems and for electrochemical energy storage systems. The physical properties assessed are melting points; phase diagrams; eutectic compositions; density; surface tension; viscosity; electrical conductivity; diffusion for ions; heat of fusion; heat capacity; volume change on fusion; vapor pressure; thermal conductivity (liquid and solid); and cryoscopic constant. The status of corrosion studies in the form of annotated bibliographic summaries, and salient observations on safety and hazards are also reported. A summarizing series of tables are provided as index to the data-gaps status for this set of candidate materials. DOE

NBO-10644/ Department of Energy, Washington, D. C. Div. of Legislative Research and Analysis.
SUMMARY OF MAJOR ENERGY LEGISLATION OF THE 95TH CONGRESS
Dec. 1979 158 p
(DOE/TIC-10118) Avail: NTIS HC A08/MF A01

The title, sponsor, synopsis, and legislative status of major energy lesiglation of the 95th Congress includes the following subjects: Alaska lands, Alaska gas transportation, antiboycott legislation, backhauling, Canadian fuel imports, cargo preference/tanker safety, Clean Air Act, coal conversion, coal leasing, coal slurry pipelines, cogeneration, dealer protection, Department of Energy (organization), DOE FY-79 appropriations and authorizations, divestiture, electric energy and utilities, energy conservation, energy impact assistance, Energy Policy Institute, ERDA FY-78 authorizations, ERDA/FEA FY-78 appropriations, enhanced oil recovery, environment and safety, FEA FY-78 authorization, fuels transportation safety, gasohol, geothermal energy, insulation standards, liquefied natural gas, mine safety, National Energy Act, natural gas, nuclear energy, nuclear siting and licensing, nuclear waste management, oil and gas leasing, oil import fees, oil pollution liability, oil shale commercialization, outer continental shelf, pipeline destruction, Safe Drinking Water Act, solar energy, state energy management program, strip mining, and uranium mill tailings. DOE

NBO-10645/ Los Alamos Scientific Lab., N. Mex.
ECONOMIC PERFORMANCE OF PASSIVE SOLAR HEATING: A PRELIMINARY ANALYSIS
Fred Roach, Scott Noll (New Mexico Univ., Albuquerque), and Shaul Ben-David 1978 11 p refs Presented at AIAA/ASERC Conf. on Solar Energy, Phoenix, Arizona, 27-29 Nov. 1978
(LA-UR-78-2861; Conf-781133) Avail: NTIS HC A02/MF A01

For the thermal storage wall two types of storage medium-masonry (Trombe) and water are examined. In addition, a night insulation option is included in the thermal storage wall concept, thus giving rise to four alternative passive designs. The economic performance of these alternative designs is evaluated on a state-by-state basis. The architectural design criteria, solar performance characteristics, and the incremental solar cost of each solar design are reviewed. Conventional energy costs are discussed as well as the optimal sizing/feasibility criterion employed in the economic performance analysis. Nationwide feasibility results are reviewed for each alternative design. In addition to contracting the solar systems themselves, the effects of two incentive proposals-the National Energy Act (NEA) income tax credits and low interest loads-upon each design are examined. Major conclusions are summarized for each design. DOE

NBO-10646/ Notre Dame Univ., Ind. Dept. of Electrical Engineering.
OPTIMAL CONTROL STUDIES OF A SOLAR HEATING SYSTEM
M. Somasundaram, James L. Melsa, and Donald R. Farris 1978 6 p refs Presented to IEEE Midcom on Electron., Dallas, Tex., 13 Dec. 1978

(Contract W-7405-eng-36)
(LA-UR-78-2556; Conf-781208) Avail: NTIS HC A02/MF A01

Performance bounds were established for a heating, ventilating and air conditioning system in a solar heated and cooled building. Perfect knowledge of environmental conditions such as ambient temperature, wind velocity and insulation was assumed in order to determine whether prior knowledge of such information can be effectively employed to reduce the amount of auxiliary energy used. The optimal control study is based on a model of the 660000 sq. ft. National Security and Resources Study Center at the Los Alamos Scientific Laboratory. DOE

N80-10647# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
STATE-OF-THE-ART SURVEY OF JOINABILITY OF MATERIALS FOR OTEC HEAT EXCHANGERS
R. J. Beaver Dec. 1978 85 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6284) Avail: NTIS HC A05/MF A01

Literature and industrial sources were surveyed to assess, on the basis of apparent economics and reliability, the joinability of both shell-and-tube and compact ocean thermal energy conversion (OTEC) heat exchangers. A no-leak requirement is mandatory to prevent mixing seawater and the ammonia working fluid. The operating temperature range considered is 7 to 28 C (45 to 82 F). Materials evaluated were aluminum, titanium, copper-nickel, AL-6X austenitic stainless steel, singly and in combination with steel and concrete. Many types of welding and brazing processes, roller expansion, magnaforming, O-ring sealing, and adhesive bonding were considered. The automatic gas tungsten-arc welding process and explosion welding processes are the only two joining processes that now appear to offer the high reliability required of no-leak shell-and-tube heat exchangers. Of the two processes, the gas tungsten-arc welding process appears to be the more economically attractive. DOE

N80-10648# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
ENERGY TRANSFER IN ANISOTROPIC SYSTEMS. A: EXCITATION MIGRATION IN SUBSTITUTIONALLY DISORDERED ONE-DIMENSIONAL SOLIDS. B: THE SPECTROSCOPY OF MOLECULES ABSORBED ON METAL SURFACES
D. A. Zwemer Nov. 1978 231 p refs
(Contract W-7405-eng-48)
(LBL-8332) Avail: NTIS HC A11/MF A01

The energy and dynamics of excited states in a variety of anisotropic environments, including isotopically and chemically mixed crystals and molecular overlayers adsorbed on a nickel (III) surface were investigated. The relationship between local and long-range structure and spectroscopic properties was explored. A theory for energy transfer in substitutionally disordered solids is presented. Explicit expressions for the diffusion coefficients and the energy partitioning ratios in binary systems were derived. Energy transfer between localized states was found to be facilitated by concurrent tunnelling and thermal promotion. DOE

N80-10649# Los Alamos Scientific Lab., N. Mex.
SIMPLE PROCEDURE FOR ASSESSING THERMAL COMFORT IN PASSIVE SOLAR HEATED BUILDINGS
William O. Wray 1979 6 p refs Presented to Intern. Solar Energy Soc. Meeting, Atlanta, Ga., 28 May 1979
(Contract W-7405-eng-36)
(LA-UR-79-1337; Conf-790541-5) Avail: NTIS HC A02/MF A01

A thermal comfort equation, a procedure for assessing thermal comfort levels in passive solar heated buildings is presented. A thermal index called the equivalent uniform temperature is introduced to relate comfort levels in nonuniform environments to uniform conditions. DOE

N80-10650# Sandia Labs., Albuquerque, N. Mex.
DETERMINATION OF THE TECHNICAL AND ECONOMIC FEASIBILITY OF LUMINESCENT SOLAR CONCENTRATORS Final Report
C. F. Rapp, N. L. Boling, I. M. Thomas, G. L. Opdycke, R. B. Fachter, J. Chrysochoos, and P. S. Friedman Mar. 1979 213 p refs
(Contract EY-76-C-04-0789)
(SAND-79-7005) Avail: NTIS HC A10/MF A01

A somewhat different concentrator configuration was investigated. In the configuration, a thin luminescent film is deposited on all undoped substrate. The luminescence then originates in the film but is trapped within the entire thicker structure. In this study, a large number of fluorescent dopant-host combinations were identified. These were primarily organic but inorganic materials were also included. Absorption spectra, emission spectra and quantum efficiencies were measured on various samples in order to identify the best candidates for the luminescent concentrator device. Six inch by six inch and twelve inch by twelve inch concentrator plates were made which demonstrated approximately 15% effective concentrator efficiencies. The major loss mechanisms responsible for decreases in collector efficiencies were identified and quantitatively evaluated. Efficiency improvement factors of several times appear possible. DOE

N80-10651# Brookhaven National Lab., Upton, N. Y.
STATE OF THE ART OF SENSIBLE HEAT STORAGE FOR SOLAR HEAT PUMP SYSTEMS
Philip D. Metz 1979 9 p refs Presented to Solar Energy Storage Options Workshop, San Antonio, Tex., 18 Mar. 1979
(Contract EY-76-C-02-0016)
(BNL-25909; Conf-790328-4) Avail: NTIS HC A02/MF A01

Factors which influence the storage characteristics of solar source heat pump systems are discussed including: solar collection devices, the heat pump, and the utility interface. Some of the characteristics of solar source heat pumps storage are specified such as: temperature range and thermal inertia. The storage options which are discussed are: rock beds, water tanks, ground coupled storage, swimming pools, and ponds. DOE

N80-10652# Colorado State Univ., Fort Collins. Solar Energy Applications Lab.
ANALYSIS OF A LiCl OPEN-CYCLE ABSORPTION AIR CONDITIONER WHICH UTILIZES A PACKED BED FOR REGENERATION OF THE ABSORBENT SOLUTION DRIVEN BY SOLAR HEATED AIR Final Report, Dec. 1977 - Sep. 1978
Cecile M. Leboeuf and G. O. G. Loef Oct. 1978 32 p refs
(Contract EG-77-S-02-4546)
(COO-4546-1) Avail: NTIS HC A03/MF A01

The technical feasibility of lithium chloride open cycle absorption air conditioner which utilizes solar heated air for reconcentration of the absorbent solution is examined. The use of a packed bed concentrator was described. Operating conditions for a 3-ton residential unit are determined from equilibrium data, conservation of mass and energy, and transfer rate equations. Humidity, air temperature, and packing type are varied to determine their effect on packed bed performance and required packing volumes. The required operating temperatures, humidities, and flow rates are comparable to those which can be obtained from a conventional solar air-heating system during the summer, especially in dry climates. Construction and testing of a packed bed of appropriate design is recommended for validation of the analysis. DOE

N80-10653# Colorado State Univ., Fort Collins. Solar Energy Applications Labs.
PRELIMINARY ANALYSIS OF A TOTAL SOLAR HEATING SYSTEM Final Report, Dec. 1977 - Sep. 1978
James A. Leffar, P. Burns, and C. B. Winn Oct. 1978 28 p
(Contract EG-77-S-02-4546)
(COO-4546-4) Avail: NTIS HC A03/MF A01

A set of computer simulation programs was developed such that the programs provide a useful design tool for the design of total solar heating systems. DOE

N80-10654# Carrier Corp., Syracuse, N. Y. Energy Systems Div.
DEVELOPMENT OF A HIGH TEMPERATURE SOLAR POWERED WATER CHILLER. VOLUME 3: PHASE 1 Technical Progress Report, 26 Sep. 1977 - 1 Jun. 1978
Richard A. English Jun. 1978 121 p refs

(Contract EG-77-C-03-1590)
(SAN-1590-1/3-Vol-3) Avail: NTIS HC A06/MF A01

The conceptual design rationale and resulting design configuration are described as well as estimates of cost and performance. Because the development of the turbocompressor design paralleled the development of the chiller system design, all of the cost and performance data are based on intermediate turbo-compressor performance data, as well as on unoptimized components. Optimized performance was computed. DOE

N80-10655# Alabama Univ., Huntsville.
EXPERIMENTAL AND NUMERICAL STUDIES OF LIQUID STORAGE TANK THERMAL STRATIFICATION FOR A SOLAR ENERGY SYSTEM Semiannual Progress Report, 1 Mar. - 31 Aug. 1978
S. T. Wu 29 Sep. 1978 24 p
(Contract EG-77-S-02-4479)
(COO-4479-2) Avail: NTIS HC A02/MF A01

The construction of the thermal stratification system was completed and checked out. The details of this check-out procedure are included. The physical dimensions of the facility are shown. This storage tank is a modified septic tank with a capacity of 1500 gallons. This tank is installed with approximately half of the tank below ground. Insulation is 3 in of spray-on foam externally and 1 in internally, protected by a butyl rubber covering. The liquid level in the tank is 44 in. DOE

N80-10656# Colorado State Univ., Fort Collins. Solar Energy Applications Lab.
SOLAR GENERATION OF INDUSTRIAL STEAM. INNOVATIVE RESEARCH PROGRAM SUBTASK Final Report, Dec. 1977 - Sep. 1978
Terry Lenz Oct. 1978 10 p refs
(Contract EG-77-S-02-4546)
(COO-4546-9) Avail: NTIS HC A02/MF A01

Comparison of hybrid solar-mechanical (vaporization at low pressure followed by compression), inorganic salt eutectic and polymer latent heat slurry, and solar-thermochemical schemes, pointed to the thermochemical approach as most promising. The condensed-phase reactions were studied. The following classes of reactions meet the set of criteria: reversibly-catalyzed thermal isomerizations, Diels-Alder additions, and esterifications. These particular reaction classes offer significant potential for lower temperature solar-thermochemical systems with condensed phase energy storage. DOE

N80-10657# PRC Energy Analysis Co., Los Angeles, Calif.
SATELLITE POWER SYSTEM (SPS) PRELIMINARY SOCIETAL ASSESSMENT
Charles Bloomquist, A. Daurio, and S. Shotland May 1979 69 p refs
(Contract EG-77-C-01-4024)
(HCP/R4024-01/14) Avail: NTIS HC A04/MF A01

The findings of fourteen papers dealing with SPS societal issues are presented. While numerous societal problems and potential concerns are delineated, no program stoppers were identified. Thus, in so far as the societal ramifications of an SPS are concerned, additional study of the concept is warranted. Societal topics which merit particular attention in the future are delineated. These include rectenna site availability, utility integration, and institutional/international considerations. Study findings that might be used in a comparative assessment of the SPS with alternative energy systems are presented. Methodological considerations for future SPS societal research are also discussed. DOE

N80-10658# Honeywell, Inc., Minneapolis, Minn. Energy Resources Center.
COST-EFFECTIVE CONTROL SYSTEMS FOR SOLAR HEATING AND COOLING APPLICATIONS Final Report
Jane H. Pejsa, W. W. Bassett, S. A. Wenzler, K. H. Nguyen, and T. J. Olsen Sep. 1978 180 p refs
(SAN-1592-1) Avail: NTIS HC A09/MF A01

A methodology is defined and the results are presented to arrive at control recommendations for a variety of climate control system designs, applications and regions, strategies, functions, sensors, actuators, and the controllers themselves. The bulk of the study effort - an attempt to simulate and evaluate system performance for several representative residential and commercial heating and cooling designs and thus to derive improved performance techniques within cost-effective control systems - are discussed. DOE

N80-10659# International Business Machines Corp., Huntsville, Ala.
SOLAR ENERGY SYSTEM PERFORMANCE EVALUATION: A-FRAME INDUSTRIES, SINGLE FAMILY DWELLING, KANEOHE, HAWAII Progress Report, Feb. - Sep. 1978
D. L. Nemetz 1978 29 p refs
(Contract EG-77-C-01-4049)
(SOLAR/1010-78/14) Avail: NTIS HC A03/MF A01

The operation of the solar energy system is summarized. This system is designed to provide domestic hot water for a single family dwelling in Kaneohe, Hawaii. Measured system performance is evaluated and measured climatic data are compared with long term average conditions. Performance evaluations of each major subsystem are also presented. DOE

N80-10660# Pennsylvania Univ., Philadelphia. Dept. of Mechanical Engineering and Applied Mechanics.
OPTIMAL INSULATION OF PIPES AND TANKS FOR SOLAR HEATING SYSTEMS
Gerard F. Jones and N. Lior Feb. 1979 75 p refs
(Contract EM-78-C-04-5319)
(ALO-5319-2) Avail: NTIS HC A04/MF A01

A compact and time effective insulation design procedure for solar heating system piping and water-filled thermal storage tanks was developed. Recognizing the particular sensitivity of solar systems to cost, the economic aspect of the problem is treated by a comprehensive present-value life-cycle cost analysis. In the development of the method, a numerical sensitivity analysis was performed to determine the relative effects of all relevant independent variables (within their pertinent ranges) on piping and tank heat transfer coefficient values. DOE

N80-10661# Idaho National Engineering Lab., Idaho Falls.
OVERVIEW OF GEOTHERMAL ENERGY IN THE UNITED STATES
Robert J. Schultz and E. G. DiBello 1 May 1979 14 p refs Presented at the Energy Conserv. Symp., San Francisco, 1 May 1979
(Contract EY-76-C-07-1570)
(Conf-790530-1) Avail: NTIS HC A02/MF A01

The development of hydrothermal resources, hot igneous rock resources, and conduction dominated resources is reviewed. Geothermal power generation and direct applications in the U.S. are discussed. DOE

N80-10662# Westinghouse Research and Development Center, Pittsburgh, Pa.
PERFORMANCE MONITORING OF AN OFF-PEAK HEATING AND COOLING SYSTEM UTILIZING THERMAL STORAGE AND SOLAR AUGMENTED HEAT PUMP
W. C. Moreland Apr. 1979 39 p
(EPRI-ER-845) Avail: NTIS HC A03/MF A01

The instrumentation system (including sensors and data logging equipment) used in the demonstration system are described. A general description is also given of the modes of operation of the main heat pump/storage/solar system, the proposed methodology and format for data reduction, and the present status of the program. DOE

N80-10663# Midwest Research Inst., Golden, Colo.
SOLAR POND CONCEPTS: OLD AND NEW
T. S. Javadev, Michael Edesess, and Jon Henderson 1979 7 p refs Presented at the 14th Intersoc. Energy Conversion Eng. Conf., Boston, 5-10 Aug. 1979
(Contract EG-77-C-01-4042)
(SERI/TP-35-208; Conf-790803-3) Avail: NTIS HC A02/MF A01

Different types of solar ponds were considered from the early 1900s to the present. Salty ponds use salt to create a nonconvecting pond. Shallow solar ponds were investigated by Shuman and Willsie in 1906 and 1907 and are currently being studied by Lawrence Livermore Laboratories. Swedish investigators are studying a combination of solar collectors and water

storage in a pond-cover configuration. In addition, there are thermoclines created in large bodies of water, as in large reservoirs. The various types of solar ponds are surveyed and the best of the ideas are combined to synthesize new concepts. A new solar pond concept is presented which combines the good features of convecting and nonconvecting (salty) ponds. DOE

N80-10664# California Univ., Livermore. Lawrence Livermore Lab.

EFFECT OF MECHANICAL ENERGY STORAGE SYSTEMS ON THE CHARACTERISTICS OF ELECTRIC VEHICLES

Martin W. Schwartz 14 May 1979 7 p Presented at the 14th Intersoc. Energy Conversion Conf., Boston, 5-10 Aug. 1979; Sponsored by the Am. Chem. Soc.

(Contract W-7405-eng-48)

(UCRL-82710; Conf-790803-17) Avail: NTIS HC A02/MF A01

Batteries for electric vehicle propulsion were investigated to see if effective trade-offs between short term peak power capability and energy storage capacity are possible. It was found that batteries in combination with a mechanical energy storage device can optimize both power and range capability of an electric vehicle. Equations were derived for determining the vehicle mass fraction of the mechanical energy storage system that is required to achieve a vehicle mass saving or increase in range. The extent to which mechanical energy storage systems can improve electric vehicle performance was found to depend upon the battery type and the vehicle power/mass requirements. DOE

N80-10665# Department of Energy, Washington, D. C. Office of Conservation and Solar Applications.

WASTE HEAT UTILIZATION: PROCEEDINGS OF 1978 ENGINEERING FOUNDATION CONFERENCE

Apr. 1979 327 p refs Conf. held at Henniker, N. H., 13-18 Aug. 1978

(CONF-7808102) Avail: NTIS HC A15/MF A01

Fifteen papers are presented containing engineering concepts, improved methods, and/or equipment descriptions pertaining to waste heat utilization. R.E.S.

N80-10666# National Technical Information Service, Springfield, Va.

LITHIUM BATTERIES: CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Jun. 1979

Diane M. Cavagnaro Jul. 1979 230 p Supersedes NTIS/PS-78/0661; NTIS/PS-77/0639; NTIS/PS-76/0544

(NTIS/PS-79/0676/1; NTIS/PS-78/0661; NTIS/PS-77/0639; NTIS/PS-76/0544) Avail: NTIS HC $28.00/MF $28.00 CSCL 10C

Studies on design, development, components, corrosion, and hazards are included in this compilation of worldwide research. Lithium batteries with sulfides, chlorides, thionyl chloride, organic compounds, and water are cited. Applications cover use of lithium cells in pacemakers, spacecraft, electric vehicles, and off peak energy storage. (This updated bibliography contains 223 abstracts, 43 of which are new entries to the previous edition.) GRA

N80-10667# New Mexico Univ., Albuquerque.

WASTE UTILIZATION AS AN ENERGY SOURCE. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Progress Report, 1974 - Jul. 1979

Gerald F. Zollars Jul. 1979 55 p

(NTIS/PS-79/0765/2) Avail: NTIS HC $28.00/MF $28.00 CSCL 21D

Articles from the international literature concerning the processing of solid and organic wastes for use as an energy source are cited. Industrial agricultural, and residential wastes are considered as sources of both gaseous and liquid fuels such as methane, methanol, ethanol, and synthane. This bibliography contains 219 entries. GRA

N80-10668# New Mexico Univ., Albuquerque. Technology Application Center.

AIRCRAFT FUEL CONSERVATION: CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Progress Report, 1974 - Jul. 1979

Gerald F. Zollars Jul. 1979 43 p Sponsored in part by NTIS, Springfield, Va.

(NTIS/PS-79/0764/5) Avail: NTIS HC $28.00/MF $28.00 CSCL 10A

These 160 citations concern means to conserve fuel in airline operations. Articles dealing with aircraft design, fuels, engine design, propulsion efficiency, and operating procedures which conserve fuel are included. GRA

N80-10669# National Technical Information Service, Springfield, Va.

NICKEL CADMIUM BATTERIES. VOLUME 1: CITATIONS FROM THE NTIS DATA BASE Progress Report, 1970 - 1978

Diane M. Cavagnaro Jul. 1978 201 p

(NTIS/PS-79/0646/4) Avail: NTIS HC $28.00/MF $28.00 CSCL 10C

This bibliography cites reports concerning the design fabrication, components, testing, and assembly of nickel cadmium batteries. Most of the citations cover the development of power supplies for aircraft and spacecraft. (This updated bibliography contains 195 abstracts, none of which is new to the previous edition.) GRA

N80-10670# National Technical Information Service, Springfield, Va.

NICKEL CADMIUM BATTERIES. VOLUME 2: A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1977 - Jun. 1979

Diane M. Cavagnaro Jul. 1978 122 p Supersedes NTIS/PS-78/0618; NTIS/PS-77/0555; NTIS/PS-76/0466; NTIS/PS-75/445

(NTIS/PS-79/0647/2; NTIS/PS-78/0618; NTIS/PS-77/0555; NTIS/PS-76/0466; NTIS/PS-75/445) Avail: NTIS HC $28.00/MF $28.00 CSCL 10C

The design, fabrication, components, testing, and assembly of nickel cadmium batteries are covered in the bibliography. The majority of these citations deal with the development of power supplies for aircraft and spacecraft. This updated bibliography contains 116 abstracts, 23 of which are new entries to the previous edition. GRA

N80-10671# National Technical Information Service, Springfield, Va.

LITHIUM BATTERIES. VOLUME 2: CITATIONS FROM THE NTIS DATA BASE Progress Report, 1975 - 1977

Diane M. Cavagnaro Jul. 1979 214 p

(NTIS/PS-79/0674/8) Avail: NTIS HC $28.00/MF $28.00 CSCL 10C

This bibliography covers the design, development, components, testing, corrosion, electrolytes, sealing, and hazards of lithium cells. The citations include lithium organic cells, lithium sulfur cells, lithium-water air cells, and lithium nickel fluoride cells. The applications cover use in spacecraft, electric vehicles, off peak energy storage, and forklift trucks. This updated bibliography contains 205 abstracts, none of which is new to the previous edition. GRA

N80-10672# National Technical Information Service, Springfield, Va.

LITHIUM BATTERIES. VOLUME 3: CITATIONS FROM THE NTIS DATA BASE Progress Report, 1978 - Jun. 1979

Diane M. Cavagnaro Jul. 1979 103 p Supersedes NTIS/PS-78/0660; NTIS/PS-77/0638; NTIS/PS-76/0543; NTIS/PS-75/471

(NTIS/PS-79/0675/3; NTIS/PS-78/0660; NTIS/PS-77/0638; NTIS/PS-76/0543; NTIS/PS-75/471) Avail: NTIS HC $28.00/MF $28.00 CSCL 10C

Design, development, components, testing, corrosion, electrolytes, sealing, and hazards of lithium cells are presented. Batteries studied include lithium organic cells, lithium sulfur cells, lithium-water-air cells, and lithium nickel fluoride cells. Applications cover use in spacecraft, electric vehicles, off peak energy storage, and forklift trucks. This updated bibliography contains 94 abstracts, 58 of which are new entries to the previous edition. GRA

N80-10673# National Technical Information Service, Springfield, Va.

MICROWAVE HEATING: APPLICATIONS AND EQUIP-

MENT. CITATIONS FROM NTIS DATA BASE Progress Report, 1964 - May 1979
William E. Reed Jul. 1979 96 p Supersedes NTIS/PS-78/0571; NTIS/PS-77/0514; NTIS/PS-76/0446 (NTIS/PS-79/0631/6; NTIS/PS-78/0571; NTIS/PS-77/0514; NTIS/PS-76/0446) Avail: NTIS HC $28.00/MF $28.00 CSCL 13A

These Federally-funded reports cover applications of microwave heating. Excluded are reports on the use of microwave heating in medicine or in plasma studies. The bibliography does include citations of food heating, microwave oven design, drying techniques, and safety. This updated bibliography contains 90 abstracts, 19 of which are new entries to the previous edition. GRA

N80-10674# National Technical Information Service, Springfield, Va.
MICROWAVE HEATING: INDUSTRIAL APPLICATIONS. CITATIONS FROM THE ENGINEERING DATA BASE Progress Report, 1970 - May 1979
William E. Reed Jul. 1979 209 p Supersedes NTIS/PS-78/0572; NTIS/PS-77/0515; NTIS/PS-76/0447 (NTIS/PS-79/0632/4; NTIS/PS-78/0572; NTIS/PS-77/0515; NTIS/PS-76/0447) Avail: NTIS HC $28.00/MF $28.00 CSCL 13A

Industrialized uses of microwave heating are covered in these citations of worldwide research. The topics include industrial heating and drying for processes such as paper drying, vulcanization, and textile processing. Equipment design and safety are also cited. This updated bibliography contains 203 abstracts, 29 of which are new entries to the previous edition. GRA

N80-10675# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Electrical and Systems Engineering.
POLYCRYSTALLINE THIN FILM GALLIUM ARSENIDE SOLAR CELLS Final Report
J. M. Borrego and S. K. Ghandhi 30 Sep. 1978 62 p refs (Grant NSF AER-76-06168) (PB-298168/6; NSF/RA-780549) Avail: NTIS HC A04/MF A01 CSCL 10B

The objective of this program was to demonstrate the feasibility of solar cells made on a metallic substrate, using polycrystalline thin film GaAs and an upper layer of a highly conductive wide gap material such as doped tin oxide. The program has established the feasibility of making cells of this type, and has outlined problems encountered during the high temperature growth of the upper layer. In addition, room temperature growth of tin oxide has been achieved for the first time. Techniques have been developed for optical characterization of the transparent layer. Deep level transient spectroscopy methods have also been developed to aid in the improvement of the polycrystalline layer. Other accomplishments include the development of a technique for measuring diffusion length in direct gap materials, the fabrication of GaAs-Ge-Mo diodes with a BV of 35 volts, and a technique for the passivation of the grain boundary edge, which results in greatly increasing the open circuit voltage. GRA

N80-10676# National Bureau of Standards, Washington, D. C. National Engineering Lab.
A PERSPECTIVE OF A WORKSHOP ON STABILITY OF THIN FILM SOLAR CELLS AND MATERIALS Final Report
Harry A. Schafft and David E. Sawyer Jun. 1979 17 p refs Sponsored in part by DOE (PB-297396/4; NBSIR-89-1778) Avail: NTIS HC A02/MF A01 CSCL 10B

The stability of solar cells of the following three material groupings were considered: (1) Cu2S/(CdZn)S, Cu-ternaries/CdS, InP/CdS, and amorphous Si; (2) polycrystalline, MIS, and conducting-oxide Si; and (3) polycrystalline and AMOS GaAs. Considering the relative state of immaturity of these developing cells and the goal for high reliability and stability, two general areas of work are recommended. One is to develop an improved understanding of cell operation and of component structures of these cells. The other is to develop an improved measurements base. Specific needs and recommendations are provided. GRA

N80-10677# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Nuclear and Alternative Energy Systems.
GEOTHERMAL RESOURCES AND TECHNOLOGY IN THE UNITED STATES
Feb. 1979 65 p refs (PB-296623/2; ISBN-0-309-02874-4) Avail: NTIS MF A01;HC National Academy of Science, Washington, D. C., $5.50 CSCL 10B

The potentials and problems of geothermal energy are assessed with particular focus on current obstacles in the development of the geothermal industry. GRA

N80-10678# General Accounting Office, Washington, D. C. Energy and Minerals Div.
ENERGY SAVING STRATEGIES FOR FEDERAL PROCUREMENT
19 Jun. 1979 14 p (PB-296909/9; EMD-79-68) Avail: NTIS HC A02/MF A01 CSCL 10A

Federal energy conservation measures are evaluated, and what Federal agencies have done to develop and implement procurement techniques which result in reduced energy consumption is reviewed. GRA

N80-10679# General Accounting Office, Washington, D. C. Energy and Minerals Div.
NATURAL GAS RESERVES ESTIMATES: A GOOD FEDERAL PROGRAM EMERGING, BUT PROBLEMS AND DUPLICATIONS PERSIST
15 Jun. 1979 85 p (PB-296628/2; EMD-78-68) Avail: NTIS HC A05/MF A01 CSCL 10A

Improvements needed in the Government's efforts to estimate the Nation's natural gas reserves are discussed. GRA

N80-10680# National Technical Information Service, Springfield, Va.
LEAD BATTERIES, VOLUME 1. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - 1976
Diane M. Cavagnaro Aug. 1979 213 p refs (NTIS/PS-79/0781/9) Avail: NTIS HC $28.00/MF $28.00 CSCL 10C

Reports from worldwide research are cited, covering lead battery components, charging, corrosion, and testing. The majority of studies cover batteries used in electric vehicles. Citations on lead recovery from battery scrap and air pollution at battery factories are also included. This updated bibliography contains 207 abstracts, none of which are new entries to the previous edition. GRA

N80-10681# National Technical Information Service, Springfield, Va.
LEAD BATTERIES, VOLUME 2. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1977 - Jul. 1979
Diane M. Cavagnaro Aug. 1979 121 p refs Supercedes NTIS/PS-78/0690; NTIS/PS-77/0634; NTIS/PS-76-0550 (NTIS/PS-77/0634; NTIS/PS-76/0550; NTIS/PS-79/0782/7; NTIS/PS-78/0690) Avail: NTIS HC $28.00/MF $28.00 CSCL 10C

Worldwide research on lead battery components, charging, corrosion, and testing is cited. The majority of studies concern battery use in electric vehicles. Studies on lead recovery from battery scrap and air pollution at battery factories are also included. This updated bibliography contains 115 abstracts, 59 of which are new entries to the previous edition. GRA

N80-10682# National Technical Information Service, Springfield, Va.
LEAD BATTERIES. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Jul. 1979
Diane M. Cavagnaro Aug. 1979 169 p refs Supersedes NTIS/PS-78/0689; NTIS/PS-76/0549; NTIS/PS-75/472; NTIS/PS-77/0633 (NTIS/PS-79/0780/1; NTIS/PS-77/0633; NTIS/PS-78/0689; NTIS/PS-76/0549; NTIS/PS-75/472) Avail: NTIS HC $28.00/MF $28.00 CSCL 10C

The design, development, components, fabrication, chemistry,

and testing of lead batteries are cited in this compilation of Federally-funded research. Specific applications for spacecraft, consumer products, and electric vehicles are covered. Studies on lead recovery from battery scrap are covered. Several abstracts on lead toxicity in industrial plants are also cited. This updated bibliography contains 163 abstracts, 39 of which are new entries to the previous edition. GRA

N80-10683# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
FLUID DYNAMIC ASPECTS OF WIND ENERGY CONVERSION
O. DeVries (Natl. Aerospace Lab., Amsterdam) Jul. 1979 145 p refs
(AGARD-AG-243; ISBN-92-835-1326-6) Avail: NTIS HC A07/MF A01

The theory of horizontal axis and vertical axis wind driven turbines is discussed. Inhomogeneous flow, turbulence effects, turbine control, wake interference effects, and wind concentrator concepts are surveyed. K.L.

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N80-10684 Washington State Univ., Pullman.
EXPERIMENTAL DETERMINATION AND MODELING OF DRY DEPOSITION FOR OZONE Ph.D. Thesis
Maniam Palaniswamy Chockalingam 1979 111 p
Avail: Univ. Microfilms Order No. 7923471

A relationship between deposition velocity and a general diffusion parameter that is extensively used in pollutant diffusion and long range transport modeling calculations is established. The general diffusion variable is a turbulence parameter exhibiting a diurnal cycle and has relevance to the micrometeorological situation of the atmosphere at any given location. It is shown that the dry deposition velocity also exhibits a diurnal cycle. The correlation between deposition velocity and the general diffusion parameter is evaluated on field experimental data. Dissert. Abstr.

N80-10685*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE 1977 EMISSIONS INVENTORY FOR SOUTHEASTERN VIRGINIA
Dana A. Brewer (George Washington Univ., Hampton, Va.), Ellis E. Remsberg, Gerard E. Woodbury, and Linell C. Quinn Sep. 1979 30 p refs
(NASA-TM-80119) Avail: NTIS HC A03/MF A01 CSCL 13B

Regional tropospheric air pollution modeling and data compilation to simulate the time variation of species concentrations in and around an urban area is discussed. The methods used to compile an emissions inventory are outlined. Emissions factors for vehicular travel in the urban area are presented along with an analysis of the emission gases. Emission sources other than vehicular including industrial wastes, residential solid waste disposal, aircraft emissions, and emissions from the railroads are investigated. A.W.H.

N80-10686*# National Aeronautics and Space Administration, Washington, D. C.
ANALYSIS OF METHOD OF POLARIZATION SURVEYING OF WATER SURFACE OIL POLLUTION
B. S. Zhukov Sep. 1979 26 p refs Transl. into ENGLISH of "Analiz Metoda Polyarizatsionnoy Siyemki Neftyanykh Zagryaznenly Vodnoz Poverkhosti", Rept. Pr-443 Acad. of Sci. USSR, Inst. of Space Res., Moscow, 1979 p 1-30 Transl. by Scientific Translation Services, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-75708; PR-443) Avail: NTIS HC A03/MF A01 CSCL 13B

A method of polarization surveying of oil films on the water surface is analyzed. Model calculations of contrasted oil and water obtained with different orientations of the analyzer are discussed. The model depends on the spectral range, water transparency and oil film, and the selection of observational direction. A.W.H.

N80-10687*# Delaware Univ., Newark. Coll. of Marine Studies.
THE USE OF SATELLITES IN ENVIRONMENTAL MONITORING OF COASTAL WATERS Final Report
W. Philpot and V. Klemas 20 Sep. 1979 79 p refs
(Grant NsG-1433)
(NASA-CR-162409) Avail: NTIS HC A05/MF A01 CSCL 13B

The feasibility of using satellites in an operational system for monitoring the type, concentration, location, drift, and dispersion of pollutants in coastal waters is evaluated. Visible, microwave, and thermal infrared sensing are considered. Targets to be detected include photosynthetic pigments, iron acid waste, and sewage sludge. K.L.

N80-10688# California Univ., Livermore. Lawrence Livermore Lab.
THE IMPACT OF LNG SPILLS ON THE ENVIRONMENT: A COMPARISON OF DISPERSION MODELS AND EXPERIMENTAL DATA
B. R. Bowman, S. B. Sutton, and W. J. Comfort 9 Jan. 1979 6 p refs Presented at the 19th Ann. Meeting of the Inst. of Environ. Sci., Seattle, 29 Apr. - 2 May 1979
(Contract W-7405-eng-48)
(UCRL-81812; Conf-790445-1) Avail: NTIS HC A02/MF A01

Two dispersion model calculations are compared with experimental data collected for 5-cubic-meter spills of liquefied natural gas (LNG) on water. The models are a Gaussian dispersion model, which includes models for vapor generation and gravity spread, and a three dimensional solution of the compressible turbulent transient Navier-Stokes equations and associated equations for conservation of species and energy. The latter model was also run in a two dimensional mode to evaluate the utility of two dimensional calculations. These calculations are compared to data collected in LNG spill and dispersion experiments, which measured the concentration of hydrocarbons at several downwind locations. The adequacy of the models and differences between them are discussed. Areas for model improvement are indicated. DOE

N80-10689# Computer Genetics Corp., Wakefield, Mass.
REMOTE SENSING OF LNG SPILL VAPOR DISPERSION USING RAMAN LIDAR
D. A. Leonard and B. Caputo Mar. 1979 121 p
(Contract W-7405-eng-48)
(UCRL-13984) Avail: NTIS HC A06/MF A01

A field experiment which evaluated the remote sensing of hydrocarbon concentrations in the dispersing cloud of gas produced by a spill of LNG using a Raman LIDAR technique is described. The background and objectives of the effort; a description of the lidar equipment; a description of the test site and the test scenario; and sections on data analysis and recommendations are included. DOE

N80-10690# Pennsylvania State Univ., University Park.
LIKELIHOOD ESTIMATIONS OF VEGETATIVE ALTERATION NEAR KNOWN OR PROPOSED SOURCES OF AIR POLLUTION Annual Progress Report
Donald D. Davis and S. P. Pennypacker Aug. 1978 40 p refs
(Contract EE-77-S-02-4497)
(COO-4497-1; CAES-513-78; APR-1) Avail: NTIS HC A03/MF A01

A computer model to simulate and predict SO2 injury to vegetation is presented. The proposed simulator would provide valuable input information for tasks such as site selection and compilation of environmental impact statements. Such a model would also provide data to management operators for the regulation of emissions. The model would also aid in the basic understanding of the complex interactions which influence plant susceptibility to air pollution. Input to the model would consist of biological and physical data and the output would include

the probability of SO2 injuring vegetation near existing or proposed sites. DOE

N80-10691# Brookhaven National Lab., Upton, N. Y.
COMPILING A MULTISTATE EMISSIONS INVENTORY
Carmen M. Benkovitz 1978 17 p refs Presented at Conf. on Emissions Inventories and Factors, Anaheim, Calif., 13 Nov. 1978
(Contract EY-76-C-02-0016)
(BNL-25043; Conf-7B1126-1) Avail: NTIS HC A02/MF A01

The Multistate Atmospheric Power Production Pollution Study (MAP3C) is described. Topics covered include the acquisition of both emissions and ancillary data, techniques for quality assurance and data updating, and current and future plans for upgrading and using the inventory. The MAP3S program is charged with studying the entire spectrum of atmospheric pollutants that are ascribed to fossil fuel electric power production or that may interact in the atmosphere with power plant emissions. These pollutants include: (1) sulfur oxides, sulfites, and sulfates; (2) nitrogen oxides and their secondary reaction products, including oxidants; (3) hydrocarbons, including polycyclic organic matter; (4) trace inorganic elements; and (5) particulates, which may contain any or all of the above substances and elemental carbon or soot. DOE

N80-10692# Decision Focus, Inc., Palo Alto, Calif.
PROPOSED RESEARCH PLANNING FORMAT FOR THE ENVIRONMENTAL ASSESSMENT DEPARTMENT Final Report
D. Cohan and D. W. North Mar. 1979 127 p refs Sponsored by Electric Power Research Inst.
(EPRI-EA-1018; TPS-78-798) Avail: NTIS HC A07/MF A01

Issues of concern to Environmental Assessment Department (EAD) clients are reviewed, and alternative roles for EAD research are defined. The proposed planning format describes explicitly the steps in the planning and research process: identifying broad needs of industry and society; defining specific forcing issues; detailing research needs and objectives; developing research programs and projects; and producing the research results and integrated products that form the EPRI response to the original needs. An illustrative application of the planning format to the current EAD research program is included. DOE

N80-10693# Oak Ridge National Lab., Tenn. Energy Div.
SOCIOECONOMIC DATA REQUIREMENTS FOR ENVIRONMENTAL ASSESSMENT: COAL GASIFICATION AND LIQUEFACTION PROJECTS
R. Steven Konkel 1978 28 p refs Presented at the Conf. on Net Energy Anal. and Energy Modeling, Colorado Springs, 21 Aug. 1978
(Contract W-7405-eng-26)
(CONF-780843-5) Avail: NTIS HC A03/MF A01

The development of data bases and monitoring programs will allow (1) identification of baseline conditions and existing levels of stress in the environment; (2) prediction of the potential impacts of construction, operation, and decommissioning of a coal conversion complex at a specific site; (3) determination of whether these or unanticipated impacts actually occur during these periods; and (4) evaluation of the effectiveness of mitigation measures designed to lessen adverse impacts on the environment. Socioeconomic data requirements include characterization of land uses, land-use management alternatives, demography and employment, economic and fiscal indicators, and infrastructure capacities for site-specific study areas. The monitoring program should be designed to identify appropriate study areas, and incorporate input from citizen groups and local planning officials. Author

N80-10694# Oak Ridge National Lab., Tenn. Environmental Sciences Div.
ENVIRONMENTAL IMPLICATIONS FOR GEOTHERMAL ENERGY DEVELOPMENT
Robert B. Craig and Glenn W. Suter, II 1979 8 p refs Presented to the Inst. of Environ. Sci., Seattle, Wash., 29 Apr. 1979
(Contract W-7405-eng-26)
(CONF-790445-3) Avail: NTIS HC A02/MF A01

The nature of hydrothermal, hot dry resources and the constraints that site characteristics place on their development are discussed. Effects on cultural, aesthetic, and wildlife resources are considered. DOE

N80-10695# Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Health Sciences.
COAGULATION RATES OF SUB-MICRON PARTICULATES IN THE TROPOSPHERE Final Report
David L. Swift and William H. Walls Feb. 1979 56 p refs Sponsored by Md. Dept. of Natural Resources.
(PB-295756/1; PPSP/PPRP-24) Avail: NTIS HC A04/MF A01 CSCL 13B

The coagulation rates of aerosol particles in turbulent shear flow were studied experimentally. Rates for turbulent coagulation were compared with the coagulation rates resulting from Brownian motion. Under the conditions of Couette shear flow studied (in all instances turbulent) the flow induced coagulation was the dominant process. Calculation of the rate of coagulation of sub-micrometer particles in the atmosphere and in a typical power plant stack were performed with emphasis on the 'scrubbing' of sub-micrometer particles by larger particles. This was found to be an important mechanism in the stack, but not in the atmosphere, due to sedimentation and other processes. GRA

N80-10696# TRW, Inc., Redondo Beach, Calif.
EMISSION ASSESSMENT OF CONVENTIONAL STATIONARY COMBUSTION SYSTEMS. VOLUME 2: INTERNAL COMBUSTION SOURCES Final Report, Sep. 1976 - Jan. 1979
C. C. Shih, J. W. Hammersma, D. G. Ackerman, R. G. Beimer, M. L. Kraft, and M. M. Yamada Jan. 1979 239 p refs
(Contract EPA-68-02-2197)
(PB-296390/8; EPA-600/7-79-029c) Avail: NTIS HC A11/MF A01 CSCL 13B

Emissions from gas- and oil-fueled gas turbines and reciprocating engines for electricity generation and industrial applications are assessed. The results indicate that internal combustion sources contribute significantly to the national emissions burden. The source severity factor, defined as the ratio of the calculated maximum ground level concentration of the pollutant species to the level at which a potential environmental hazard exists, was used to identify pollutants of environmental concern. GRA

N80-10697# Illinois Univ. at Urbana-Champaign.
MODELING THE IMPACTS OF TRANSPORTATION SYSTEMS MANAGEMENT ON VEHICLE EMISSIONS, PHASE 1
David E. Boyce, George Provenzano, Frank Southworth, Kristi Cromwell-Cain, and Kyung S. Chon Apr. 1979 127 p refs Sponsored by the Illinois Inst. of Natural Resources.
(PB-296908/7; IINR-79/09) Avail: NTIS HC A07/MF A01 CSCL 13B

Literature on the impact of transportation systems management on travel in cities in the United States and other countries was surveyed in order to qualitatively analyze their potential effectiveness in reducing motor vehicle emissions. GRA

N80-10698# Technology Service Corp., Santa Monica, Calif.
STATISTICAL ANALYSIS OF TSP AND METEOROLOGICAL DATA IN EPA REGION 6
John Trijonis, Yuji Horie, and Dennis Bicker Jan. 1979 237 p refs
(Contract EPA-68-02-2828)
(PB-296838/6; EPA-906/9-79-005) Avail: NTIS HC A11/MF A01 CSCL 13B

Statistical analyses were conducted on total suspended particulates (TSP) in order to determine if the relationship between TSP and meteorology can be used to classify sites as to the types of sources causing nonattainment. It was found that decision tree analysis was a very effective means of characterizing the relationship between TSP and meteorology, and the TSP-meteorology relationship provides useful insights concerning the sources of high TSP levels. The results indicate distinct geographical patterns in causes of nonattainment. Despite a fair level of success with the method, however, it was found that the TSP-meteorology relationship does not provide results that are definitive or quantitative enough for it to be used as the sole

support for regulatory policy concerning causes of nonattainment. GRA

N80-10699# Research Triangle Inst., Research Triangle Park, N. C.
ANALYSIS OF ORGANIC AIR POLLUTANTS BY GAS CHROMATOGRAPHY AND MASS SPECTROSCOPY Final Report, Oct. 1975 - Sep. 1978
Edo D. Pellizzari Mar. 1979 243 p refs
(Contract EPA-68-02-2262)
(PB-296835/2; EPA-600/2-79-057) Avail: NTIS HC A11/MF A01 CSCL 07D

Analytical methods and instrumentation for collecting and analyzing hazardous vapor phase organics occurring in ambient air were developed and evaluated. The areas of investigation included: (1) the evaluation of Tenax GC sorbent for variations in the breakthrough volumes for different lots; (2) studies on in situ reactions which might occur during the collection of organic vapors from ambient air; (3) evaluation of a permeation system for delivering precise quantities of organic vapors for calibrating instruments; (4) development of software programs for quantification of volatile organics using high resolution gas chromatography/mass spectrometry/computer; (5) determination of relative molar response factors for quantitative analysis; and (6) the identification and quantification of organic pollutants in ambient air from several geographical areas within the Continental U.S. GRA

N80-10700# Water Purification Associates, Cambridge, Mass.
WASTEWATER TREATMENT IN COAL CONVERSION Final Report, Oct. 1976 - Jan. 1979
R. E. Hicks, D. J. Goldstein, F. B. Seufert, and I. W. Wei Jun. 1979 287 p refs
(Contract EPA-68-03-2207)
(PB-297587/8; EPA-600/7-89-133) Avail: NTIS HC A13/MF A01 CSCL 07A

Water treatment control technology specific to fuel conversion plant sites in the western U.S. is described. Most plants converting coal to other fuels use a large quantity of clean water (as stream) and put out a large quantity of dirty water that is condensed when the products from the coal reactor are cooled. Procedures for removing phenolic compounds are discussed: they include distillation, extraction, and adsorption. Design equations, step-by-step design procedures, and calculations for a typical unit are included along with physical data that are required for design. GRA

N80-10701# Mitre Corp., McLean, Va. Metrek Div.
HEALTH AND ENVIROMENTAL EFFECTS OF COAL GASIFICATION AND LIQUEFACTION TECHNOLOGIES: A WORKSHOP SUMMARY AND PANEL REPORTS Final Report
Richard Brown, ed. and Alice Witter, ed. May 1979 374 p
Workshop held at Leesburg, Va., Aug. 1978
(Contract DE-AC01-79EV-10018)
(PB-297618/1; MTR-79W00137; DOE/HEW/EPA-03) Avail: NTIS HC A16/MF A01 CSCL 06F

Responses to President Carter's directive to identify health and environmental problems associated with advanced energy technologies are presented. The highlights of the issues and the detailed information requirements identified by panels of a workshop held in Leesburg, Virginia in August 1978 to address the health and environmental effects of coal gasification and liquefaction technologies are presented. The purposes of the workshop were to: (1) assemble multidisciplines of biomedical and environmental scientists to address current developments in these technologies, (2) review and identify specific health and environmental issues and problems associated with their development and commercialization, and (3) consider research strategies required to address them and to identify requisite information needs for resolving uncertainties of assessing the relevant impacts of coal gasification and liquefaction technologies. The six panels of the workshop were: occupational and public health and safety; air quality; water quality, water quantity, and aquatic ecology; terrestrial effects; ambient measurement and monitoring; and source characterization. Panel reports containing specific information on environmental and health effects, information requirements, and detailed research statements are included in this report. GRA

N80-10702# Rockwell International Corp., Creve Couer, Mo. Air Monitoring Center.
REGIONAL AIR POLLUTION, QUALITY ASSURANCE AUDITS Final Report
O. Klein and F. Littman May 1979 135 p
(PB-297576/1; EPA-600/4-79-031) Avail: NTIS HC A07/MF A01

Audit results are reported for systems measuring NO, NOx, O3, SO2, total sulfur, total hydrocarbons, CH4 and CO. An investigation was conducted on the effect of Teflon particulate filters on NO, NO2, O3, and SO2 concentrations in sampled air. Sample losses are reported for synthetic pollutant - air mixtures sampled through new and used filters under both dry and humid conditions. The investigation also revealed effects of humidity on the response of analyzers to the various pollutants. The accuracy of SO2 calibration mixtures prepared with the commercial dynamic calibration system employed in the audits was investigated. The calibration system was modified to improve performance under field conditions. GRA

N80-10703# Kentucky Water Resources Research Inst., Lexington.
CHARGED MEMBRANE, LOW PRESSURE ULTRAFILTRATION TO TREAT ACID MINE DRAINAGE WATERS Research Report, 1 Oct. 1976 - 30 Sep. 1978
Dibaker Bhattacharyya, Robert B. Grieves, and Shiela Shelton May 1979 181 p refs
(Contract DI-14-34-0001-7160)
(PB-297209/9; W79-07424; OWRT-B-050-KY(1); RR-120) Avail: NTIS HC A09/MF A01 CSCL 08I

Low-pressure, ultrafiltration with negatively charged, noncellulosic membranes is shown to be a feasible process in terms of achieving the simultaneous separation of dissolved metals (and sulfate) and of suspended solids from acid mine drainage water. The process is evaluated in terms of the simultaneous achievement of good water flux without membrane fouling and of adequate ultrafiltrate quality at high water recovery for water reuse operation. The results of the ultrafiltration investigations are compared with the reported results from lime precipitation-settling and reverse osmosis treatment field studies in terms of treated water quality, reusability, concentrate (sludge) production rates, water recovery and membrane flux behavior. GRA

N80-10704# GCA Corp., Bedford, Mass. Technology Div.
FABRIC FILTER MODEL SENSITIVITY ANALYSIS Final Report, Jun. 1978-Feb. 1979
Richard Dennis, H. A. Klemm, and William Bahye Apr. 1979 214 p refs
(Contract EPA-68-02-2607)
(PB-297755/1; GCA-TR-78-26-G; EPA-600/7-79-043C) Avail: NTIS HC A10/MF A01 CSCL 13K

Preliminary tests show good agreement with field data. However, the apparent agreement between predicted and actual values was based on limited comparisions: validation was carried out without regard to optimization of the data inputs selected by the filter users or manufactures. Factors, such as air/cloth ratio, cleaning frequency, amount of cleaning, specific resistence coefficient K2, the number of compartments, and inlet concentrator were examined in various permutations. The variables that require the greatest accuracy in estimation based on their overall impact on model output were determined. GRA

N80-10705# Equitable Environmental Health, Inc., Park Ridge, Ill.
THE ECONOMIC IMPACT OF PROPOSED REGULATIONS TO REDUCE PARTICULATE EMISSIONS FROM STEEL MILLS AND INDUSTRIAL FUGITIVE SOURVES, R78-11
Apr. 1979 252 p refs
(PB-296527/5; IINR-79/06) Avail: NTIS HC A12/MF A01 CSCL 13B

The benefits and costs of proposed regulations intended to reduce emissions of particulate matter to the atmosphere are estimated. Emphasis is placed on steel mills and industrial fugitive sources. GRA

N80-10706# Association of Bay Area Governments, Berkeley, Calif.
EXAMPLE CONTROL STRATEGY FOR OZONE. VOLUME 2:

CASE STUDY OF THE SAN FRANCISCO BAY REGION, 1976-1978 Final Report
Apr. 1979 168 p refs
(Contract EPA-68-02-3001)
(PB-297800/5; EPA-450/2-79-001B; OAQPS-1.2-121) Avail: NTIS HC A04/MF A01 CSCL 13B

Information is presented to assist states and local agencies in preparing ozone control strategies for nonattainment areas. The guidance should be most useful in preparing 1982 State Implementation Plan revisions. The guideline covers the following topics: intergovernmental cooperation, development and assessment of air quality and emissions data, modelling to related air quality to emissions, control strategy analysis and assessment, plan adoption, and the continuing planning process. The case study for the San Francisco Bay Region: 1976-1978 is included. GRA

N80-10707# Monsanto Research Corp., Dayton, Ohio.
ANALYSIS OF PRIORITY POLLUTANTS AT A PRIMARY ALUMINUM PRODUCTION FACILITY Final Report, Mar. 1978 - Jan. 1979
Gary D. Rawlings and Thomas J. Hoogheem Apr. 1979 48 p refs
(Contract EPA-68-03-2550)
(PB-297491/3; MRC-DA-861; EPA-600/2-79-087) Avail: NTIS HC A03/MF A01 CSCL 13B

The source of priority pollutants, assessment of the wastewater treatment plant, and priority pollutant removal efficiency for a single Soderberg-type primary aluminum plant were investigated. Forty-eight hour composite samples were collected from the following streams: (1) plant intake water; (2) wastewater from the primary air pollution control system (gas stream cooling water and wet EPS's); (3) secondary air pollution control system (room ventilation wet scrubber liquor); (4) paste plant briquette cooling water; and (5) final effluent after the wastewater treatment plant. Wastewater from the primary air pollution control system entered a conventional chemical coagulation (using slacked lime)-clarification plant. Clarified water from the clarifier was combined with the other three wastewater streams and flowed into a settling lagoon with a 20-hr hydraulic retention time. Clarified lagoon water was finally discharged to the river. The principal source of organic compounds in the wastewater was from the primary and secondary air pollution control systems and results from the volatilization of petroleum coke and pitch in the Soderberg anode. Wastewater treatment plant removal efficiencies of greater than 85% were achieved for the majority of the organic priority pollutant species detected. GRA

N80-10708# Virginia Inst. of Marine Science, Gloucester Point.
OFFSHORE PIPELINE CORRIDORS AND LANDFALLS IN COASTAL VIRGINA, VOLUMES 1 AND 2 AND APPENDICES Final Report
Ann Hayward Rooney-Char and Ronald Page Ayres 1978 319 p
(Grant NOAA-04-7-158-44041)
(PB-297439/2) Avail: NTIS CSCL 13B

The Commonwealth's planning effort to anticipate and prepare for the possibility of oil and gas coming ashore in Virginia from the Atlantic outer continental shelves is described. A suitability methodology was developed to determine alternative locations in coastal Virginia for pipeline corridors and landfalls, given environmental and industrial concerns. Additional products of the study include: identification and description of industrial and environmental pipeline siting considerations, maps illustrating the presence of these considerations in Virgina's coastal area, and impact and mitigating measures tables for coastal resources likely to be affected by pipeline activities. GRA

N80-10751# Joint Publications Research Service, Arlington, Va.
FILTERS FOR COLLECTION OF CHEMICAL AEROSOL AND FUME SAMPLES FROM THE AIR
S. I Murav'yeva (USSR Academy of Medical Sciences), T. I. Solov'yeva (USSR Academy of Medical Sciences), N. B. Borisov (USSR Academy of Medical Sciences), L. I. Borisova (USSR Academy of Medical Sciences), and I. V. Petryanov (USSR Academy of Medical Sciences) *In its* USSR Report: Biomedical and Behavioral Sci., No. 122 12 Oct. 1978 p 89-93 refs Transl. into ENGLISH from Gig. Tr. Prof. Zabol. (USSR), no. 8, 1979 p 52-54 (For primary document see N80-10748 01-51)
Avail: NTIS HC A07/MF A01

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N80-10709* National Aeronautics and Space Administration. Pasadena Office, Calif.
BOREHOLE GEOLOGICAL ASSESSMENT Patent
William H. Spuck, III, inventor (to NASA) (JPL) Issued 11 Sep. 1979 10 p Filed 4 May 1978 Supersedes N79-19521 (17 - 10, p 1308) Sponsored by NASA
(NASA-Case-NPO-14231-1; US-Patent-4,167,111; US-Patent-Appl-SN-903019; US-Patent-Class-73-155; US-Patent-Class-175-78) Avail: US Patent and Trademark Office CSCL 08G

A method and apparatus are discussed for performing geological assessments of a formation located along a borehole, and a boring tool that bores a pair of holes into the walls of the borehole and into the surrounding strata along with a pair of probes which are installed in the holes. One of the probes applies an input such as a current or pressured fluid, and the other probe senses a corresponding input which it receives from the strata. Official Gazette of the U.S. Patent and Trademark Office

N80-10710 California Inst. of Tech., Pasadena.
VARIATION OF SEISMIC SOURCE PARAMETERS AND STRESS DROP WITHIN A DESCENDING SLAB AS REVEALED FROM BODY-WAVE PULSE-WIDTH AND AMPLITUDE ANALYSIS, PART 1. A SEISMOLOGICAL INVESTIGATION OF THE SUBDUCTION MECHANISM OF ASEISMIC RIDGES, PART 2 Ph.D. Thesis
Wei-Ying Chung 1979 206 p
Avail: Univ. Microfilms Order No. 7915593

A least squares searching technique was developed to estimate the source dimensions of intermediate and deep focus earthquakes from the azimuthal variation of body wave pulse width. Intermediate and deep earthquakes in the Tonga-Kermadec arc system were investigated in order to determine changes in the state of stress and source properties within a subducting slab. Three different modes of rupture, unilateral, bilateral, and circular faults, are compared and tested against observations. Tectonic features associated with a subducting fracture zone aseismic ridge system in the New Hebrides island arc are investigated. Several features, including a discontinuity of the trench, peculiar locations of two major islands regional uplift, and the formation of a basin are interpreted as a result of the subduction of a buoyant ridge system. Seismicity near locations of aseismic ridge subduction was investigated for five seismic regions: New Hebrides, Bonin-Mariana, Tonga-Kermadec, Peru and Northern Chile. Dissert. Abstr.

N80-10711*# Old Dominion Univ. Research Foundation, Norfolk, Va.
EVALUATION OF ATMOSPHERIC TRACE CONSTITUENT SENSORS OPERATING FROM REMOTE SPACE AND AIRBORNE PLATFORMS Final Report, period ending 13 Jun. 1979
Estelle Condon and Earl C. Kindle Oct. 1979 29 p refs
(Grant NsG-1394)
(NASA-CR-162365; GSTR-79-8) Avail: NTIS HC A03/MF A01 CSCL 04A

A laboratory gas analysis system was developed specifically to make trace level measurements of carbon monoxide. To assure that the data collected with this system are correctly aligned with other established methods for making these measurements, an intercalibration study was conducted. The calibration gas was analyzed by the various participating laboratories and found to contain 1.28 ppm CO. Samples were collected at 25 deg, 35 deg, and 45 deg N for profile data to study the variation in concentrations of CO and CH4 as a function of altitude and

latitude in continental air over the eastern seaboard of the United States. The experiment was repeated several months later to determine if there were seasonally dependent variations in the CO and CH4 concentrations. A.R.H.

N80-10712# Rice Univ., Houston, Tex.
STUDY TO ANALYZE AND SYNTHESIZE SATELLITE DATA Final Report, 1 Oct. 1977 - 30 Sep. 1978
M. Hanst, P. H. Reiff, R. W. Spiro, and R. A. Wolf Hanscom AFB, Mass. AFGL 15 Jan. 1979 34 p refs
(Contract F19628-78-C-0078; AF Proj. 2311)
(AD-A070847; AFGL-TR-79-0024) Avail: NTIS HC A03/MF A01 CSCL 04/1

We have completed four computer runs simulating the behavior of the earth's inner magnetosphere during the substorm-type event that had its onset at about 1000 UT on 19 September 1976. Our program simulated many aspects of the behavior of the closed-field-line portion of the auroral and subauroral ionosphere. For these regions, the program self-consistently computes electric fields, electric currents, hot-plasma densities, plasma flow velocities and other parameters. Our computed ionospheric electric fields compare reasonably well with corresponding data from satellite S3-2. The most striking observational feature of the electric fields in the modeled region during the 19 September 1976 event was an instance of rapid subauroral flow, which was observed on the outbound part of pass 4079B South and was also predicted by the computer runs. These computer results seem consistent with a simple analytic model for rapid subauroral flow developed by Southwood and Wolf. Birkeland-current densities predicted by the model are presented, for eventual comparison with S3-2 magnetometer data. A program has been developed to follow the evolution of the plasmasphere, or any other magnetospheric or upper-ionospheric cold-plasma boundary, through a modeled event. Some interesting preliminary results for computed plasmasphere shapes are presented. GRA

N80-10713*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
A CORRELATION BETWEEN AURORAL KILOMETRIC RADIATION AND INVERTED-V ELECTRON PRECIPITATION Progress Report
James Lauber Green, Donald A. Gurnett, and Robert A. Hoffman Jan. 1979 40 p refs
(Contracts NAS1-13129; U-of-IOWA-79-2; Grant NGL-16-001-043)
(NASA-CR-162399; AD-A070795) Avail: NTIS HC A03/MF A01 CSCL 04/1

Simultaneous observations of energetic electron precipitations and auroral kilometric radiation (AKR) were obtained from the polar orbiting satellites AE-D and Hawkeye. The Hawkeye observations were restricted to periods when the satellite was in the AKR emission cone in the northern hemisphere and at radial distances = or < 7 R(E) to avoid local propagation cutoff effects. In addition, the AE-D measurements were restricted to complete passes across the auroral oval in the evening to midnight local time sector (from 20 to 01 hours magnetic local time). This is the local time region where the most intense bursts of AKR are believed to originate. A qualitative survey of AKR and electron particle precipitation shows that AKR is more closely associated with inverted-V electron precipitation than with plasma sheet precipitation. Quantitatively, a good correlation is found between the AKR intensity and the peak energy of inverted-V events. In addition, in the tail of the most field-aligned portion (approx. 0 deg. pitch angle) of the distribution functions of the inverted-V events, systematic changes are indicated as the associated AKR intensity increases. GRA

N80-10714# Massachusetts Inst. of Tech., Cambridge.
SOURCE AND PROPAGATION EFFECTS OF RAYLEIGH WAVES FROM CENTRAL ASIAN EARTHQUAKES Ph.D. Thesis. Semi-annual Technical Report, 1 Jul. - 31 Dec. 1978
Howard Patton Apr. 1979 193 p refs
(F44620-75-C-0064; ARPA Order 1827)
(AD-A070241; AFOSR-79-0688TR; SATR-7) Avail: NTIS HC A09/MF A01 CSCL 08/11

Partial Contents: Source and Propagation Effects of Rayleigh Waves from Central Asian Earthquakes--Abstract of Doctoral Thesis; Three-Dimensional Crust and Upper Mantle Structure of the Northeastern United States; The Attenuation of Seismic Waves in Dry and Saturated Rocks; Thermal Cracking and Amplitude Dependent Attenuation; and Ultrasonic P and S Wave Attenuation in Dry and Saturated Rocks under Pressure. GRA

N80-10715# Los Alamos Scientific Lab., N. Mex.
MAGNETOPAUSE LAYER AND PLASMA BOUNDARY LAYER OF THE MAGNETOSPHERE
T. E. Eastman and E. W. Hones, Jr. 1978 22 p refs Presented at Conf. on Quantitative Modeling of Magnetospheric Processes, LaJolla, Calif., 19 Sep. 1978
(Contract W-7405-eng-36)
(LA-UR-78-2992; Conf-780938-3) Avail: NTIS HC A02/MF A01

A summary is presented of recent published results on two distinct regions of the plasma boundary layer (PBL): that bordering open field line regions and that bordering closed field line regions. The magnetopause layer can usually be identified by a change in magnetic field direction and cannot be uniquely identified by any other field or plasma parameters. Immediately earthward of this magnetopause current layer, a PBL of magnetosheath-like plasma is usually observed that has dominantly magnetosheath-like energy spectra and flow characteristics. Observed plasma boundary layer thicknesses are highly variable and are generally much larger than the magnetopause layer thicknesses even near the subsolar region. Several suggested source mechanisms for the plasma boundary layer are discussed and compared. DOE

N80-10716# Los Alamos Scientific Lab., N. Mex.
THE 1978 SYMPOSIUM ON THE RIO GRANDE RIFT. PROGRAM AND ABSTRACTS
Sep. 1978 110 p Conf. held at Santa Fe, N. Mex., 8 Oct. 1978
(Contract W-7405-eng-36)
(LA-7487-C; Conf-781082) Avail: NTIS HC A06/MF A01

Abstracts of the scientific papers given at the International Symposium on the Tectonics and Magmatism of the Rio Grande Rift are presented. Topics covered include: continental rifts, rift systems, rift magmatism, tectonics and geophysics. R.E.S.

N80-10717# California Univ., Livermore. Lawrence Livermore Lab.
STRATOSPHERIC H2O
Hugh W. Ellsaesser 25 Mar. 1979 13 p refs Presented at NASA Stratospheric Workshop, Harper's Ferry, W. Va., 4 Jun. 1979
(Contract W-7405-eng-48)
(UCRL-82542; Conf-790607-1) Avail: NTIS HC A02/MF A01

The extreme aridity of the lower stratosphere and the rapid decrease of mixing ratio with height just above the polar tropopause is documented. The Brewer stratospheric circulation hypothesis is coupled with a lower stratosphere winter pole freeze dry sink to explain the available data over Antarctica. According to the hypothesis, all air enters through the tropical tropopause where it is freeze dried to a mass mixing ratio of two to three ppM. This dry air then spreads poleward and descends through the polar tropopauses, overpowering upward transport of water vapor by diffusion, which would otherwise be permitted by the much warmer temperatures of the polar tropopauses. DOE

N80-10718# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
MAGNETIC POTENTIAL PLOTS OVER THE NORTHERN HEMISPHERE FOR 26-28 MARCH 1976
A. D. Richmond, H. W. Kroehl, M. A. Henning, and Y. Kamide Apr. 1979 123 p refs
(PB-297195/0; UAG-71; NOAA-79052401) Avail: NTIS HC A06/MF A01 CSCL 04A

Contour maps of magnetic potential variations over the Northern Hemisphere at 10 min intervals between 0000 UT, 26 March and 0550 UT, 28 March 1976 are presented. These are excerpts from a larger data set, with plots every minute, which were used to make a data moving picture. GRA

N80-10719# National Center for Atmospheric Research, Boulder, Colo.
INVESTIGATION OF POSSIBLE SUN-WEATHER RELATIONSHIPS
Steven Businger 1978 83 p refs
(Grant NSF ATM-77-23757)
(PB-297385/7; NCAR-CT-49) Avail: NTIS HC A05/MF A01 CSCL 04A

Statistical correlations between anomalous solar activity (as denoted by large solar flares, active plages, and interplanetary magnetic sector boundaries) and the circulation of the troposphere are reviewed. Two indexes (measuring atmospheric vorticity and mean zonal geostrophic flow in the Northern Hemisphere) are analyzed in an effort to reveal possible sun-weather relationships. The result of this analysis provides no additional statistical evidence for a connection between solar activity and the weather. Finally, physical mechanisms that have been suggested to explain the claimed correlations are discussed. GRA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N80-10720# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19304D GSRS MISSILE NUMBER 1026, ROUND NUMBER V-25
30 Apr. 1979 21 p
(DA Proj. 1T6-65702-D-126)
(AD-A071425; ERADCOM/ASL-DR-1012) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19304D GSRS, Missile Number 1026, Round Number V-25, are presented in tabular form. GRA

N80-10721# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19702A GSRS, MISSILE NO. 301, ROUND B-10
Apr. 1979 17 p
(DA Proj. 1T6-65702-D-126)
(AD-A070707; ECOM-DR-1003) Avail: NTIS HC A06/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19702A GSRS, Missile Number 301, Round Number B-10, are presented in tabular form. GRA

N80-10722# Army Electronics Command, White Sands Missile Range, N. Mex.
THE 19305D GSRS, MISSILE NUMBER 1020, ROUND NUMBER V-21 Meteorological Data Report
Apr. 1979 16 p
(DA Proj. 1T6-65702-D-126)
(AD-A070559; ECOM-DR-999) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19305D GSRS, Missile Number 1020, Round V-21, are presented in tabular form. GRA

N80-10723# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19304D GSRS, MISSILE NUMBER 1023, ROUND NUMBER V-23 Meteorological Data Report
Apr. 1979 17 p refs
(DA Proj. 1T6-65702-D-126)
(AD-A070558; ECOM-DR-1004) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19304D GSRS, Missile Number 1023, Round V-23, are presented in tabular form. GRA

N80-10724# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 12823AT LANCE, MISSILE NUMBER 3382, ROUND NUMBER 327 ECL 8 MARCH 1979
Mar. 1979 40 p
(AD-A070557; ECOM-DR-992) Avail: NTIS HC A03/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 12823AT Lance, Missile Number 3382, Round Number 327 ECL, are presented in tabular form. GRA

N80-10725# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19702A GSRS, MISSILE NUMBER N/A, ROUND NUMBER B-6/B-7, 28 MARCH 1979
Mar. 1979 26 p
(AD-A070556; ECOM-DR-995) Avail: NTIS HC A03/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19702A GSRS, Missile Number N/A, Round Number B-6/B-7, are presented in tabular form. GRA

N80-10726# Army Electronics Command, White Sands Missile Range, N. Mex.
THE 19702A GSRS, MISSILE NUMBER 087, ROUND NUMBER B-11 Meteorological Data Report
Apr. 1979 15 p
(DA Proj. 1T6-65702-D-126)
(AD-A070549; ECOM-DR-1002) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19702A GSRS, Missile Number 087, Round Number B-11, are presented in tabular form. GRA

N80-10727# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE (FA) 19304 GSRS, MISSILE NUMBER 1019, ROUND NUMBER V-20 Meteorological Data Report
Mar. 1979 20 p
(DA Proj. 1T6-65702-D-126)
(AD-A070830; ECOM-DR-996) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of (FA) 19304 GSRS, Missile Number 1019, Round Number V-20, are presented in tabular form. GRA

N80-10728# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19702A GSRS, ROUND NUMBERS B-2 AND B-3 21 FEBRUARY 1979
Mar. 1979 24 p
(AD-A070814; ECOM-DR-990) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19702A GSRS, Round Numbers B-2 and B-3 are presented in tabular form. GRA

N80-10729# Environmental Research and Technology, Inc., Concord, Mass.
METEOROLOGICAL DATA ANALYSIS IN SUPPORT OF THE ABRES PROGRAM Final Report, Jan. 1978 - Jan. 1979
Kenneth R. Hardy Jan. 1979 28 p refs
(Contract F19628-76-C-0069; AF PROJ. 627A)
(AD-A070946; ERT-P-1996F; AFGL-TR-79-0084) Avail: NTIS HC A03/MF A01 CSCL 04/2

The Air Force Geophysics Laboratory (AFGL) has been tasked by the Space and Missiles System Organization (SAMSO) to provide meteorological analysis in support of the Advanced Ballistic Reentry Systems (ABRES) Program. The primary objectives of the work carried out under this contract have been to assist AFGL in: (1) the analysis of surface, upper air, and satellite data leading to the computation of liquid water content profiles, (2) the analysis of special observational data obtained from aircraft flight experiments, (3) computer analysis of radar data, (4) development of display techniques for the AFGL Liquid Water Content Analyzer, (5) the evaluation of the uncertainties in the estimation of hydrometeor mass concentrations using radar and aircraft measurements, and (6) the assessment of thin cirrus cloud over the tropical Pacific. GRA

N80-10730# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.

EVALUATION OF THE PASSIVE REMOTE CROSSWIND SENSOR Research and Development Technical Report, 31 Jan. - 8 Mar. 1978

Ruben Rodriguez May 1979 75 p refs

(DA Proj. 1L1-62111-AH-71)

(AD-A071176; ERADCOM/ASL-TR-0032) Avail: NTIS HC A04/MF A01 CSCL 04/2

Field measurements of integrated path crosswinds were made at Biggs Optical Range, Biggs Army Airfield, Fort Bliss, Texas, during the period 31 January to 8 March 1978 with the passive remote crosswind sensor, a system that measures crosswinds by detecting and analyzing the movement of atmospheric scintillations. Data collected with this sensor were compared to integrated path wind averages measured by the calibrated anemometer array. Presented in this report are X-Y scatter plots, derived weighting functions, analog comparative plots, and sampled analog data. Conclusions and recommendations are made in the last sections. GRA

N80-10731# Eastman Kodak Co., Rochester, N. Y. Apparatus and Optical Div.

SPECTRAL RADIOMETRIC MEASUREMENT AND ANALYSIS PROGRAM. VOLUME 2: DESCRIPTION OF THE DATA COLLECTION PROGRAM Final Report

Lawrence G. Christensen, R. Simmons, G. Schauss, R. Norton, and R. Schoenfeld Apr. 1979 168 p

(AD-A072079; AWS-TN-79/001-Vol-2) Avail: NTIS HC A08/MF A01 CSCL 14/2

This report covers a recently completed contract with the United States Air Force Air Weather Service to conduct research into the transfer of atmospheric energy in the visible and near-infrared portions of the electromagnetic spectrum. Its objective was to produce a spectral model of path transmittance, radiance, and ground-level irradiance that could be related to meteorological observations through the use of simultaneous, insitu data collections. The instrumentation package developed under subcontract to Eastman Kodak by the Albuquerque Division of EG and G was used in a 14-month data-collection program. The program had two objectives: (1) to collect spectral radiometric data on the atmosphere and on ground-level surface irradiance under the broadest possible range of climatic/meteorological conditions, and (2) to collect radiometric and meteorological data in such a way that would permit them to be related mathematically. In this field collection portion of the task, data was obtained for 18 different climatic conditions. This volume (2) of the final report describes the design of the data collection program conducted in the field, the ranges of importance experimental parameters, the measurements and supportive observations that were made, and the analytical software developed to perform the statistical analyses on the resulting data. GRA

N80-10732# Fleet Weather Central/Joint Typhoon Warning Center, FPO San Francisco, Calif. 96630.

TYPHOON REPORT, 1978 Annual Report, Jan. - Dec. 1978

Dean R. Morford and James K. Lavin 1978 176 p

(AD-A070904) Avail: NTIS HC A09/MF A01 CSCL 04/2

This annual publication summarizes the tropical cyclone season in the western North Pacific, Bay of Bengal, and the central North Pacific. A brief narrative is given on each typhoon in the western North Pacific including the best track. Pertinent reconnaissance data used to construct the best tracks are provided. Forecast verification data and statistics for the JTWC are summarized. Research efforts at the JTWC are discussed briefly. GRA

N80-10733# Army Electronics Research and Development Command, White Sands Missile Range, N. Mex.

LANCE MISSILE NO. 4388, ROUND NO. 330 ACL

Apr. 1979 29 p

(DA Proj. 1T6-65702-D-126)

(AD-A071335; ERADCOM/ASL-DR-1007) Avail: NTIS HC A03/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 12821 Lance, Missile Number 4388, Round Number 330 ACL, are presented in tabular form. GRA

N80-10734# Geo-Atmospherics Corp., Lincoln, Mass.

SENSITIVITY STUDY OF CFAS AND CFAR OBJECTIVE ANALYSIS TECHNIQUES Final Report

W. D. Mount, B. R. Fow, B. D. Mount, and J. F. Rapp Feb. 1979 276 p refs

(Contract DAEA18-76-C-0060)

(AD-A071452; ASL-CR-79-0060-1) Avail: NTIS HC A13/MF A01 CSCL 04/2

The Cloud/Fog Analysis System (CFAS) and the Cloud/Fog Application Routines (CFAR) were applied to weather data bases to determine their sensitivity to control parameters and to type, density, and distribution of observing stations. The data rich region of southeastern United States was selected and hourly aviation weather (Service A), six-hourly synoptic (Service C), and twelve-hourly radiosonde (RAOB) observations were collected for weather scenarios of interest to Army aviation. Computer methods were developed to process these data and convert them into a form suitable for CFAS. Objective analyses and output displays were generated using CFAS and CFAR, respectively, on such weather variables as sky cover, lowest cloud base, ceiling, visibility, significant present weather, and cloud obscuration to pilot's vision within discrete flight layers. Results, produced from large variations in the computer control parameters and density and distribution of stations, were used to modify the CFAS and CFAR to correct for detected errors and to fix the control parameters so that users are now relieved of that responsibility. This greatly simplifies the knowledge and experience required to execute CFAS. A large number of color-coded displays was generated to demonstrate feasibility, skill, and detail that is possible with an automated meteorological system in providing weather information tailored to Army user needs. GRA

N80-10735# Naval Postgraduate School, Monterey, Calif.

ANALYSIS OF STATISTICAL PARAMETERS FROM SATELLITE DIGITAL DATA, JULY 1978 GOES-WEST, FOR USE IN DIAGNOSING MARINE FOG M.S. Thesis

Otto Frank McNab Mar. 1979 69 p refs

(AD-A072145) Avail: NTIS HC A04/MF A01 CSCL 04/2

GOES West Infrared (IR) and Visual (VIS) satellite observations for the North Pacific Ocean area, 35-55N, 120W-180, at 2345 GMT for eight June/July 1978 dates are processed to yield 20 statistical parameters which are analyzed for their use in discerning the existence of marine fog. The exploratory sample of 522 satellite observations, at 3 nmi x 3 nmi resolution (at subsatellite point) are related to the associated 0000 GMT synoptic ship reports which serve the role of ground truth. The best discrimination between fog/no-fog observations, using the statistical parameters, occurs for stratification of the data by the meridional component of the wind (south vs north), IR temperature, and the standard deviation of IR temperature. GRA

N80-10736# Avco-Everett Research Lab., Mass.

TURBULENCE ENVIRONMENT CHARACTERIZATION Final Technical Report, 15 Oct. 1975 - 30 Sep. 1978

M. G. Miller and P. L. Zieske Jun. 1979 135 p refs

(Contract F30602-76-C-0054; AF Proj. 2646)

(AD-A072379; RADC-TR-79-131) Avail: NTIS HC A07/MF A01 CSCL 04/2

This report presents discussions of a variety of activities and results related to the characterization of atmospheric turbulence and its effects on optical propagation at the AMOS Observatory on Maui, Hawaii. The report is divided into two major parts. The first part summarizes the measurements carried out during the entire program and presents an integrated view of the AMOS turbulence environment. Numerical values and the statistics of several optical parameters such as the Mutual Coherence Function correlation scale, r sub o, and the aperture averaged (36cm) log-amplitude variance are discussed. Furthermore, an averaged AMOS turbulent profile based on data from several different instrumental systems is defined. Values of optical parameters derived from this profile are in good agreement with their directly measured values. The most important conclusion drawn from this analysis is that sufficient information now exists to provide a consistent model of the average AMOS environment. However, due to a variety of short term behavior, the application of this model to the detailed operation of various systems should be approached with care. The second part discusses the activities carried out during the period 1 October

1977 - 30 September 1978. Included is a discussion of experimental operations, instrumentation status and data reduction and analysis. GRA

NBS-10737/ BDM Corp., Monterey, Calif.
AIRCRAFT MEASUREMENTS OF MICROMETEOROLOGICAL PARAMETERS AT PANAMA CITY, FLORIDA, IN 1978
Christopher W. Fairall 1 Apr. 1979 185 p refs
(Contract N00014-78-C-0204)
(AD-A070956; BDM/M-79-008) Avail: NTIS HC A09/MF A01 CSCL 04/2

A preliminary analysis and listing is given of micrometeorological data obtained from aircraft measurements. Thirteen flights were made on ten different days from 26 November 1978 to 13 December 1978. The typical flight duration was approximately three hours. Three types of flight pattern were employed for specific environmental characterization: low-level, constant altitude runs for sea surface temperature maps, spiral ascents and descents for surface-to-altitude profiles, and 'ladder' profiles obtained from level runs of two minutes duration at successively increasing altitudes for marine boundary layer turbulence structure. A printout of the primary variables of interest for each flight is presented as a time series (32 second average). A similar printout for each ladder profile (a series of two minute averages at constant altitude) is also presented. GRA

NBS-10738/ Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 12823A LANCE MISSILE NUMBER 4724 ROUND NUMBER 332 NCL
May 1979 39 p
(DA Proj. 1T1-66572-D-126)
(AD-A072044; ERADCOM/ASL-DR-1018) Avail: NTIS HC A03/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 12823A Lance, Missile No. 4724, Round No. 332 NCL, are presented in tabular form. GRA

NBS-10739/ Oak Ridge National Lab., Tenn. Environmental Sciences Div.
METEOROLOGICAL DATA BASES AVAILABLE FOR THE UNITED STATES DEPARTMENT OF ENERGY OAK RIDGE RESERVATION
R. H. Strand and Charles W. Miller Dec. 1978 23 p refs
(Contract W-7405-eng-48)
(ORNL/TM-6358; ESD-Publ-1184) Avail: NTIS HC A02/MF A01

Solar radiation, precipitation, wind, and temperature phenomena are being monitored at two sites on the Oak Ridge Reservation-Oak Ridge and Walker Branch Watershed. For these two sites and two non active sites on the Reservation, height of the instruments, the available data for the parameters, and the temporal distribution of the data collected are described. Examples of data access and the contact for accessing the data are given. DOE

NBS-10740/ National Bureau of Standards, Washington, D. C. Center for Radiation Research.
SELF-STUDY MANUAL ON OPTICAL RADIATION MEASUREMENTS PART 1: CONCEPTS. CHAPTERS 7: THE RELATIVE SPECTRAL RESPONSIVITY AND SLIT-SCATTERING FUNCTION OF A SPECTRORADIOMETER. CHAPTER 8: DECONVOLUTION. CHAPTER 9: PHYSICALLY DEFINING MEASUREMENT-BEAM GEOMETRY BY USING OPAQUE BARRIERS.
Henry J. Kostkowski, John B. Shumaker, and Fred E. Nicodemus Jun. 1979 137 p refs
(PB-296047/4; NBS-TN-910-4) Avail: NTIS HC A07/MF A01 CSCL 20F

This is the fourth in a series of Technical Notes (910-) entitled Self-Study Manual on Optical Radiation Measurements. The manual is a comprehensive tutorial treatment of the measurement of incoherent radiation that is complete enough for self instruction. Detailed chapter summaries make it also a convenient authoritative reference source. The manner in which the spectral responsivity of a spectroradiometer containing a monochromator varies with wavelength is treated. Deconvolution is the numerical process of recovering an improved spectral distribution from spectroradiometric measurements inevitably smeared spectrally by the spectral-responsivity function of the radiometer. The physical definition of measurement beams, including the integration limits in the measurement equation, is treated in terms of geometrical-optics quantities and concepts. GRA

NBS-10741/ Aero Systems, Inc., Boulder, Colo.
SIERRA COOPERATIVE PILOT PROJECT, FIELD Final Report, 1978 - 1979
William Carley, Fredrick Sollheim, Edwin Berry, and Lyle Lilie 31 May 1979 93 p
(Contract DI-9-07-85-V0022)
(PB-297065/5) Avail: NTIS HC A05/MF A01 CSCL 04B

Basic cloud physics parameters related to determining a cloud's seedability are presented. The analysis of seedability, as indicated by a continued presence of available supercooled liquid water and small numbers of ice crystals, suggests that these situations are rare in northern Sierra Nevada storms. The tentative implication is that costs effective operational cloud seeding may not be possible in the northern Sierra Nevada. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

NBS-10742/ Georgia Marine Science Center, Savannah.
HYDROGRAPHIC OBSERVATIONS IN THE GEORGIA BIGHT, JULY 1977
L. P. Atkinson, A. L. Edwards, J. J. Singer, W. S. Chandler, and G. A. Paffenhofer Feb. 1979 135 p refs
(Contracts EY-76-S-09-0889; EY-76-S-09-0936; Grant NOAA-04-7-158-44126)
(PB-297135/6; TR-79-03; NOAA-79060402; TR-79-3) Avail: NTIS HC A07/MF A01 CSCL 08J

From 4 to 8 July, 1977 five hydrographic sections and one temperature section were made in the Georgia Bight between Savannah, Georgia and Jacksonville, Florida. Salinity, temperature, dissolved oxygen, nutrient (NO3, PO4, SiO2), and chlorophyll data were collected. Nutrient rich intrusions of cold, deep Gulf Stream waters were observed off Savannah and Jacksonville. GRA

NBS-10743/ National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
CIRCULATION AND HYDROGRAPHY NEAR KODIAK ISLAND, SEPTEMBER TO NOVEMBER 1977
J. D. Schumacher, R. K. Reed, M. Grigsby, and D. Dreves May 1979 54 p refs
(PB-297421/0; NOAA-TM-ERL-PMEL-13; NOAA-79061310)
Avail: NTIS HC A04/MF A01 CSCL 08C

Conductivity, temperature, and depth observations are presented and discussed. There was weak, southwestward flow along the outer continental shelf and gyrelike features in the troughs separating the shoal banks. On the inner shelf near the Kenai Peninsula, a well developed westward flow was present; transport of this flow increased from September to October. The horizontal and vertical distributions of properties are influenced by both the circulation and the sharply varying bank-trough topography. Tidal mixing over the banks appears to be an important factor, and local upwelling induced by wind events also exerts influence on water structure. The westward flowing band of low salinity water off the Kenai Peninsula appears to be strongly affected by freshwater drainage from land. GRA

NBS-10744/ Hawaii Inst. of Marine Biology, Honolulu.
METABOLIC RESPONSES OF SHALLOW TROPICAL BENTHIC MICROCOSM COMMUNITIES TO PERTURBATION Final Report
S. V. Smith, P. L. Jokiel, G. S. Key, and E. B. Guinther Jun. 1979 67 p refs
(Grant EPA-R-800906)
(PB-298243/7; EPA-600/3-79-061) Avail: NTIS HC A04/MF A01 CSCL 08A

Benthos communities simulating various aspects of coral reefs were established in 600-liter microcosm tanks. These communities were then subjected to various environmental perturbations, including altered light regime, altered substratum type, salinity depression, elevated nutrient level, and biological manipulation. The metabolic responses of the community to these perturbations were monitored primarily by analysis of dissolved oxygen flux. Light, substratum type, and nutrient levels are resources which limit community metabolism. From 35 to 22 parts per 1000 by weight, metabolism is not sensitive to salinity. Metabolism is sensitive to biological manipulation. GRA

N80-10998# Joint Publications Research Service, Arlington, Va.

MINISUBS FOR DEEP-SEA EXPLORATION

Aleksandr Dumev *In its* USSR Report: Biomedical and Behavioral Sci., No. 112 23 Jul. 1979 p 64-71 refs Transl. into ENGLISH from Tekhnika Molodezh' (Moscow), no. 4, 1979 p 24-26 (For primary document see N80-10993 01-99)
Avail: NTIS HC A06/MF A01

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N80-10745*# National Aeronautics and Space Administration, Washington, D. C.

THE EFFECT OF DYNAMIC FACTORS OF SPACE FLIGHT ON ANIMAL ORGANISMS

A. M. Genin, ed. Sep. 1979 243 p refs Transl. into ENGLISH from the book 'Vliyaniye Dinamicheskikh Faktorov Kosmicheskigo Poleta na Organizm zhivotnhy', Moscow, Nauka Press, 1979 p 1-73, 79-148, 165-183, 186-191, 192, 196-217, 219-223, 231, 248 Transl. by Kanner (Leo) Associates, Redwood City, Calif. (Contract NASw-3199)
(NASA-TM-75892) Avail: NTIS HC A11/MF A01 CSCL 06C

Physiological, biochemical and morphological studies made on the Cosmos-782 biosatellite are presented. Rats, which were exposed on the biosatellite for 19.5 days, were examined immediately after completion of the flight and also during the 25 day period of readaptation to earth's conditions. The effect of factors of space flight, primarily weightlessness, on the organism was investigated for all systems of the body. R.E.S.

N80-10746# Desmatics, Inc., State College, Pa.

AN EXAMINATION OF STATISTICAL IMPACT ACCELERATION INJURY PREDICTION MODELS BASED ON TORQUE AND FORCE VARIABLES

Dennis E. Smith and John J. Peterson Jul. 1979 23 p refs (Contract N00014-79-C-0128)
(AD-A071625; TR-112-1) Avail: NTIS HC A02/MF A01 CSCL 06/19

This technical report describes the construction of impact acceleration injury prediction models from a set of twenty-eight -G sub x accelerator runs involving Rhesus monkeys with securely restrained torso and unrestrained head. Peak torque and force variables measured during these runs were used to predict injury likelihood. The relative contribution of these variables was examined with respect to the original and a modified version of the data set. Two possible prediction models were used to construct two critical envelopes, i.e., those values of the variables for which the predicted probability of injury (or fatality) is less than or equal to some specified probability. The preferred model was identified and discussed. GRA

N80-10747# Oak Ridge National Lab., Tenn.

TYPES OF AQUATIC MICROCOSMS AND THEIR RESEARCH APPLICATIONS

J. M. Giddings 1978 34 p refs Presented at the Symp. on the Savannah River Ecology Laboratory, Augusta, Ga., 8 Nov. 1978
(Contract W-7405-eng-26)
(CONF-781101-1; ESD-Publ-1254) Avail: NTIS HC A03/MF A01

Aquatic microcosm research has developed along two basic lines, the model ecosystem and the model food chain. Originally used mainly to test ecological hypotheses, microcosms are now finding applications in assessing the environmental effects of human activities, particularly chemical pollution. A critical problem today is selection of appropriate microcosm types for different research needs. Model ecosystems are used for studying community or ecosystem-level phenomena, such as diversity, stability, nutrient cycling, and energy flow, under controlled conditions. Model food chains, which are simpler, easier to analyze, but less realistic than model ecosystems, are applicable to studies of population dynamics, interspecific competition, predator-prey interactions, and trophic dynamics. In contaminant research, microcosms are more useful as predictive tools than as screening tools. DOE

N80-10748# Joint Publications Research Service, Arlington, Va.

USSR REPORT: *BIOMEDICAL AND BEHAVIORAL* SCIENCES, NO. 122

12 Oct. 1979 134 p
(JPRS-74365) Avail: NTIS HC A07/MF A01

Various topics in biomedical and behavioral sciences are considered. Pharmacology in aerospace medicine, psychometric test equipment for assessing the human functional state, and air filters for removal of aerosols and fumes from the air are among the topics covered. For individual titles, see N80-10749 through N80-10751.

N80-10749# Joint Publications Research Service, Arlington, Va.

PROBLEMS OF PHARMACOLOGY IN SPACE MEDICINE

c52

V. S. Shaskov and B. B. Yegorov *In its* USSR Report: Biomedical and Behavioral Sci., No. 122 12 Oct. 1979 p 1-20 refs Transl. into ENGLISH from Farmakol. Toksikol. (USSR), no. 4, 1979 p 325-339 (For primary document see N80-10748 01-51)
Avail: NTIS HC A07/MF A01

The effective use of drugs during the various stages of space flight is considered. The formulation and preparation of the composition of drugs for onboard medicine kits is discussed in terms of the specific factors of space flight, i.e. weightlessness. The use of drugs to enhance resistance to the factors of space flight is also discussed. J.M.S.

N80-10750# Joint Publications Research Service, Arlington, Va.

A PORTABLE STAND FOR ASSESSING THE DYNAMICS OF A WORKING INDIVIDUAL'S FUNCTIONAL STATE

c54

A. B. Leonova and V. G. Romanyuta *In its* USSR Report: Biomedical and Behavioral Sci., No. 122 12 Oct. 1979 p 41-48 refs Transl. into ENGLISH from Tekhnicheskaya estetika (USSR), no. 7, 1979 p 24-26 (For primary document see N80-10748 01-51)
Avail: NTIS HC A07/MF A01

A portable, experimental test standard based on the use of a microprocessor as a working memory is described. Experiments aimed at studying the dynamics of human functional state during learning activity were conducted in order to test the portable stand. Results are presented and discussed. J.M.S.

N80-10751# Joint Publications Research Service, Arlington, Va.

FILTERS FOR COLLECTION OF CHEMICAL AEROSOL AND FUME SAMPLES FROM THE AIR **c45**

S. I. Murav'yeva (USSR Academy of Medical Sciences), T. I. Solov'yeva (USSR Academy of Medical Sciences), N. B. Borisov (USSR Academy of Medical Sciences), L. I. Borisova (USSR Academy of Medical Sciences), and I. V. Petryanov (USSR Academy of Medical Sciences) *In its* USSR Report: Biomedical and Behavioral Sci., No. 122 12 Oct. 1979 p 89-93 refs Transl. into ENGLISH from Gig. Tr. Prof. Zabol. (USSR), no. 8, 1979 p 52-54 (For primary document see N80-10748 01-51)
Avail: NTIS HC A07/MF A01

Filters capable of effectively trapping toxic agents present in air in different aggregate forms at high rates of air pumping were developed. Thin fiber filtering material (Petryanov filter, FP) was used along with finely ground sorbents. The main parameters

characterizing the filters were sorbent content per unit filter surface and aerodynamic resistance of the filter to the flow of air passing through it at a rate of 1 cm/s. The sorption properties of various filter compositions were tested. Results are given and indicate that filters based on FP filtering material and finely ground OU-A carbon can be used for simultaneous trapping of aerosols and fumes of some organic compounds, for the purpose of assaying their levels in the air environment. J.M.S.

N80-10752# Joint Publications Research Service, Arlington, Va.

USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 13, NO. 5, 1979

O. G. Gazenko, ed. 29 Oct. 1979 145 p Transl. into ENGLISH of Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 1-87

(JPRS-74470) Avail: NTIS HC A07/MF A01

The physiological and biological effects of various space flight factors are considered. Motion sickness in weightlessness, effects of hypoxia and hypokinesia on metabolism, toxicity of the atmosphere of pressurized chambers, and aspects of the closed ecological system are among the topics covered. For individual titles, see N80-10753 through N80-10776.

N80-10753# Joint Publications Research Service, Arlington, Va.

CURRENT CONCEPTIONS ON THE GENESIS OF VESTIBULOVEGETATIVE DISORDERS IN WEIGHTLESSNESS c52

B. I. Polyakov In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 1-12 refs Transl. into ENGLISH of Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 3-10 (For primary document see N80-10752 01-51)

Avail: NTIS HC A07/MF A01

The hypotheses of the genesis of vestibulo-vegetative disorders in weightlessness are analyzed. Preference is given to the concept which attaches greatest importance to the changes in stereotyped interactions of analyzers responsible for space perception. It is however, emphasized that neither hypothesis can account for all the phenomena seen in crewmembers in orbital flight. It is, therefore, indicated that mechanisms of vestibulo-vegetative disorders need further study. It is believed that the most promising line of research is to study the role of endogenous factors determining individual variations of motion sickness susceptibility. J.M.S.

N80-10754# Joint Publications Research Service, Arlington, Va.

EFFECT OF HYPOXIA ON FLUID-ELECTROLYTE METABOLISM AND RENAL FUNCTION IN MAN AS RELATED TO DIFFERENT DEGREES OF MOTOR ACTIVITY c52

A. I. Grigoryev, V. I. Korolkov, G. I. Kozyreyskaya, and M. A. Dotsenko In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 13-18 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 10-14 (For primary document see N80-10752 01-51)

Avail: NTIS HC A07/MF A01

It was demonstrated that a prolonged (24 days) bed rest at altitudes of 2200 m and 3200 m as well as at sea level was accompanied by an increased renal excretion of fluids and osmotically active substances, including electrolytes. Exercises done during bed rest induced a smaller increase of the renal excretion of sodium and potassium. However, as bed rest continued the differences between the groups of test subjects disappeared. The levels of hypoxia and exercises used in the study proved inefficient to prevent changes in the fluid-electrolyte metabolism occurring during bed rest. Author

N80-10755# Joint Publications Research Service, Arlington, Va.

POSSIBILITY OF USING BONE CONDUCTION IN AVIATION RADIO COMMUNICATION c32

E. V. Lapayev, V. S. Kuznetsov, G. I. Tarasenko, and M. I. Katalov In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 19-25 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 14-19 (For primary document see N80-10752 01-51)

Avail: NTIS HC A07/MF A01

The dissemination of verbal sounds emitted by man over the cranial bones was investigated in order to improve the quality of speech perception and reproduction over communication channels equipped with noise-suppressing devices. The generation of a verbal signal by the articular system, extending through the cranial bones (microphone channel) and distinctions of auditory perception of a verbal signal through the bone (telephone channel) was studied. It is concluded that a combined use of advanced anti-noise devices and a bone transducer makes it possible to provide a better quality of speech perception under noisy conditions. The frequency characteristics of the bone transducer depend on its location and configuration. Author

N80-10756# Joint Publications Research Service, Arlington, Va.

SPEECH ILLUSIONS AND SIGNIFICANCE THEREOF TO AEROSPACE PRACTICE c32

I. Shults and M. Moravek In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 26-29 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 19-21 (For primary document see N80-10752 01-51)

Avail: NTIS HC A07/MF A01

The pattern of erroneous perception of intelligible and incoherent words accompanied by loud noise was investigated. It was found that proper interpretation of incoherent words depends on their rhythmic, or syllabic structure. As a rule, the words are reconstructed in the back-to-forward direction. One and two syllable words with predominant median and low frequencies are those which are most frequently subjected to speech illusions. J.M.S.

N80-10757# Joint Publications Research Service, Arlington, Va.

AGE-RELATED DISTINCTIONS OF CHANGES IN PSYCHOPHYSIOLOGICAL FUNCTIONS OF PILOTS IN THE CIVIL AVIATION UNDER THE INFLUENCE OF VIBRATION AND NOISE c52

Yu. N. Kamenskiy and Ye. A. Sokolova In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 30-34 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 21-24 (For primary document see N80-10752 01-51)

Avail: NTIS HC A07/MF A01

The effect of vibration and noise of helicopters on the psychophysiological functions of their crewmembers was studied in relation to their age. The changes were mostly pronounced in pilots younger than 20-25 and older than 45 years. The peculiar changes in the psychophysiological functions can be associated with the age-related features of adaptation to vibration and noise effects and with the different level of professional training. Author

N80-10758# Joint Publications Research Service, Arlington, Va.

DIETARY SUPPLEMENTS USED TO PREVENT SOME CHANGES IN THE HUMAN BODY IN THE PRESENCE OF NERVOUS AND EMOTIONAL STRESS c54

V. P. Bychkov and M. V. Markaryan In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 35-39 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 25-28 (For primary document see N80-10752 01-51)

Avail: NTIS HC A07/MF A01

Stress situations similar to those encountered in space flight were simulated. These included: (1) ascent to an altitude of 8000 m in a pressure chamber; (2) anticipation of gravitational acceleration on a centrifuge; and (3) performance mental activity under the conditions of time defficiency in 'success' and 'failure' situations. Changes in protein, carbohydrate, and vitamin metabolism, heart rate, adrenal function, and peripheral blood were noted. Nutrient ingredients (vitamins, glucose, minerals, phosphatid concentrate) added to the diet before and during stressful exposures were shown to correct the parameters studied. J.M.S.

N80-10759# Joint Publications Research Service, Arlington, Va.

ROENTGENOLOGICAL EXAMINATION OF THE HUMAN HEART AFTER 100-DAY HYPOKINESIA c52

I. G. Krasnych *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 40-44 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 28-31 (For primary document see N80-10752 01-51)

Avail: NTIS HC A07/MF A01

Two groups of male test subjects (each of 3 persons) took part in a 100-day bed rest experiment. During the study, group 2 did exercise. X-ray examinations showed that bed rest induced changes in the roentgenoanatomical structure of the heart, a decrease of its size and a disorder of its contractile function. In group 2 these changes were far less expressed. The recovery took 3 to 6 months. Author

N80-10760# Joint Publications Research Service, Arlington, Va.

EFFECT OF SPACE FLIGHT CONDITIONS ON DEOXYRIBONUCLEOPROTEIN AND NUCLEIC ACID CONTENT OF RAT TISSUES

E. Misurova, R. A. Tigranyan, K. Kropaceva, and M. Prasicka *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 29 Oct. 1979 (JPRS-74470) p 45-49 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm Med. (Moscow), vol. 13, no. 5, 1979 p 32-35 (For primary document see N80-10752 01-51)

Avail: NTIS HC A07/MF A01

The spleen of rats flown for 19.5 days aboard the biosatellite Cosmos-782 showed a significant increase of polydeoxyribonucleotides and a decrease of DNP and DNA. The spleen of synchronous rats did not exhibit any differences. This suggests that the increase of polydeoxyribonucleotides in flight rats immediately post-recovery was a result of the so-called gravity stress. The liver and white blood cells did not display any significant changes in DNP or nucleic acids. The changes in the content of nucleic acids in the thymus and bone narrow were insignificant. Author

N80-10761# Joint Publications Research Service, Arlington, Va.

REACTIONS OF RATS TO OVERHEATING FOLLOWING PROLONGED HYPOKINESIA

P. V. Vasilyev, G. D. Glod, Ye. P. Melnikova, L. N. Nikolskiy, S. V. Petrukhin, S. I. Sytnik, and N. N. Uglova *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 50-57 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 35-41 (For primary document see N80-10752 01-51)

Avail: NTIS HC A07/MF A01

The influence of hypokinesia on the nature of development of hyperthermia and dynamics of functional state of the animal thermoregulatory system is described. It was shown that following acute thermal exposures, the survival rate and life-time of hypodynamic rats increased. The changes were more expressed after 15-day than after 30-day hypokinesia. By the 7th recovery day thermal stability of rats approached the initial level. M.M.M.

N80-10762# Joint Publications Research Service, Arlington, Va.

EFFECT OF HYPOKINESIA ON HIGHER NERVOUS ACTIVITY OF ALBINO RATS

M. A. Kuznetsova and Ye. S. Meyzerov *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 58-62 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 41-44 (For primary document see N80-10752 01-51)

Avail: NTIS HC A07/MF A01

The effect of a 22-day hypokinesia study on the labyrinthine behavior of white rats was investigated. The test animals showed certain behavioral changes which developed throughout 22 days. However, significant changes occurred only during the first 6-7 days. Later, the changes diminished but retained their trend. The behavioral changes can be associated with inhibition of the nervous processes of higher cerebral compartments responsible for the higher nervous activity. M.M.M.

N80-10763# Joint Publications Research Service, Arlington, Va.

THE COMBINED EFFECT OF CARBON MONOXIDE AND HYPOKINESIA c52

B. I. Abidin, V. V. Kustov, V. I. Belkin, and A. N. Kondratyev *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 63-68 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 44-48 (For primary document see N80-10752 01-51)

Avail: NTIS HC A07/MF A01

The 30-day experiment, in which white male rats were exposed to a combined effect of hypokinesia and carbon monoxide at a concentration of 0.05 + or - 0.002 mg/l, showed that carbon monoxide did not influence significantly hypokinesia-induced changes. It is concluded that maximally allowable concentrations of carbon monoxide need not be reduced for 30-day hypokinesia exposures. Author

N80-10764# Joint Publications Research Service, Arlington, Va.

LEVELS AND PROPORTION OF RNA AND PROTEINS IN THE SYSTEM OF THE NEURON: VESTIBULAR NUCLEAR NEUROGLIA AND CEREBELLUM DURING HYPOKINESIA c52

L. M. Mamalyga *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 69-75 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 49-53 (For primary document see N80-10752 01-51)

Avail: NTIS HC A07/MF A01

The changes in the cell structures of the vestibular Bechterew's and Deiter's nuclei and in the cerebellal cortex were studied in rats in the presence of reduced muscular activity. The RNA and protein content were used to assess the direction and severity of changes in the functional activity of these brain elements. It was concluded that the restriction of motor activity has a substantial effect on RNA and protein content of the neuroglia system. The nature of changes in these substances was related both to the force of the extreme factor and morphofunctional organization of the brain, and the biochemical structure as well. M.M.M.

N80-10765# Joint Publications Research Service, Arlington, Va.

SOME HEMODYNAMIC PARAMETERS DURING RESPIRATION OF OXYGEN UNDER EXCESSIVE PRESSURE c52

K. I. Murakhovskiy and L. I. Letkova *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 76-81 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 53-57 (For primary document see N80-10752 01-51)

Avail: NTIS HC A07/MF A01

The experimental findings on the pattern and value of circulation changes in ten test subjects exposed to oxygen breathing at positive pressure of 20 mm Hg are cited. The major parameters of central circulation were registered by the method of radioactive label (I131) dilution. During the exposure, the test subjects showed an average 27% decrease in the cardiac output as compared with the control level. The test subjects who were pretrained to the exposure displayed a smaller reduction of cardiac output. The circulation changes found under the experimental conditions were mainly induced by peripheral changes rather than by the cardiac function. It is concluded that the reduction of cardiac output is associated with a decrease of the venous return to the heart caused by the diminished circulating blood volume and by the increased total peripheral resistance. M.M.M.

N80-10766# Joint Publications Research Service, Arlington, Va.

BICHROMATE OXIDABILITY AS A CRITERION OF QUANTITATIVE LEVELS OF ORGANIC IMPURITIES IN RECLAIMED WATER c54

V. A. Kryuchkov and N. S. Mareyeva *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 82-87 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 57-61

(For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

Experiments were carried out to study permanganate and bichromate oxidation of chemicals that may contaminate reclaimed water, initial and intermediate products of reclamation. Permanganate oxidability can be used as a qualitative indicator of water contamination with readily oxidizable admixtures only. Bichromate oxidability can be employed as a quantitative indicator of the total content of organic admixtures, provided that oxidation is carried out in a certain way. For the water reclaimed from the atmospheric condensate the following correlation between bichromate oxidability and the concentration of admixtures has been established: 1 mg O2 consumed corresponds approximately to 0.66 mg of organic admixtures in water. M.M.M.

N80-10767# Joint Publications Research Service, Arlington, Va.

AMOUNT OF MICROORGANISMS DISCHARGED FROM THE UPPER RESPIRATORY TRACT AND INTEGUMENT OF PEOPLE CONFINED IN A SEALED CHAMBER c52

S. N. Zaloguyev, A. N. Viktorov, K. V. Zarubina, and V. P. Gorshkov In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 88-92 *refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow),* vol. 13, no. 5, 1979 p 61-65 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

In an enclosure the rate of microorganisms discharged into the ambient atmosphere increased significantly. There was a correlation between the rate, on the one hand, and the environmental parameters and hygienic measures used, on the other. The data characterizing the rate with which microorganisms are discharged into an enclosed environment can be applied for the design of air purification systems. Author

N80-10768# Joint Publications Research Service, Arlington, Va.

ULTRASTRUCTURAL CHANGES IN CANINE HEPATOCYTES DURING CONTINUOUS CHRONIC EXPOSURE TO LOW DOSES OF GAMMA RADIATION c52

L. A. Bespalova, V. V. Shikhodyrov, and V. S. Romanov *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 93-99 *refs* Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 65-69 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

Electron microscopy of the liver of dogs exposed to chronic 6-year gamma-irradiation from the Co60 source demonstrated early changes in the hepatocyte structure at a relatively low dosage of 63 rad for 3 years. A comparative study of the submicroscopic reaction of hepatocytes of 3 groups of test dogs showed equally pronounced changes in the endoplasmatic reticulum: vacuolar transformation balloon dystrophy. The heterogeneity of ultrastructural changes of different hepatocytes was probably associated with a simultaneous development of processes of injury, reparation and adaptation of intracellular structures during the long-term gamma-irradiation exposure. Parallel development of these processes assured reparative biosynthesis to maintain the normal hepatic function. Author

N80-10769# Joint Publications Research Service, Arlington, Va.

RUSH NUTS (CYPERUS ESCULENTUS) AS A SOURCE OF VEGETABLE OIL IN A CLOSED LIFE SUPPORT SYSTEM c54

M. P. Shilenko, G. S. Kalacheva, G. M. Lisovskiy, and I. N. Trubachev *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 100-105 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 70-74 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

The cultivation schemes, productivity, total biochemical, lipid in particular, composition of nodules of chufa (Cyperus esculentus) were studied, using a phytotron. Upon continuous illumination, chufa yielded a high total productivity and a satisfactory coefficient of economic effectiveness (not less than 50%). Chufa nodules have an optimal ratio of proteins, carbohydrates, and fats containing essential fatty acids. To meet man's requirements for vegetable oils and essential fatty acids, it is necessary to produce daily 150-200 g dry chufa nodules which are quite acceptable as a dietary ingredient. Author

N80-10770# Joint Publications Research Service, Arlington, Va.

A METHOD OF DEFINING THE OPTIMUM LEVEL OF IONIZING RADIATION FROM DETERMINATE SOURCES DURING SPACE FLIGHTS c52

A. V. Kolomenskiy and V. A. Sakovich In its USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 106-110 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 74-76 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

A method of determining the permissible dose, Dd (or dose rate) of such determinate radiations over the entire flight is described. The criterion of radiation safety in the form of maximum risk is obtained with a minimum weight of such protection. It is also possible to extend this method to a large number of sources, each with its own protection, unrelated to other sources. J.M.S.

N80-10771# Joint Publications Research Service, Arlington, Va.

PSYCHOPROPHYLAXIS OF FATIGUE AND FUNCTIONAL CARDIOVASCULAR DISEASES IN PILOTS BY MEANS OF SELF-CONDITIONING c52

A. N. Gurov *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 111-113 ref Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 77-78 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

The great physical and emotional tension inherent in flight work, and the effects of various adverse flight factors (temperature changes, lowering of partial oxygen pressure, restriction of movements, gravitational influence, etc.) are considered in terms of development of early fatigue and functional cardiovascular diseases. Psychological, moral, and political pilot training to increase mental and physical resistance to various flight factors is shown to be effective in reducing flight fatigue and structural cardiovascular diseases. J.M.S.

N80-10772# Joint Publications Research Service, Arlington, Va.

USE OF SHORT-ARM CENTRIFUGE TO PREVENT DECONDITIONING WHEN IMMERSED IN WATER (ACCORDING TO H-REFLEX) c52

B. I. Zborovskaya *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 114-116 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 78-79 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

The possibility of using periodic rotation on a short-arm centrifuge (SAC) as a means of preventing the adverse effects of immersion was assessed. Healthy volunteer subjects were immersed in water for 3 days. The rate of build-up of accelerations constituted 0.2 units/s, time of exposure to accelerations of +3Gz constant in magnitude and direction constituted 5 min. Each subject was submitted to +3Gz after pure immersion and immersion combined with periodic rotation on a SAC, where accelerations of +0.8 Gz, +1.2 Gz or 1.6 Gz were generated for 60 min twice a day (first series) and for 40 min 3 times a day (second series). The subjects were positioned on the SAC in such a manner as to have the axis of rotation traverse the region of the bridge of the nose. Under these conditions, neuromuscular functions were tested by the methods of the H (Hoffmann) reflex and electromyography. Results are discussed. J.M.S.

N80-10773# Joint Publications Research Service, Arlington, Va.

COURSE OF ALTITUDE CAISSON DISEASE IN DOGS EXPOSED TO ACCELERATIONS

V. I. Prodin and I. N. Chernyakov *In its* USSR Report: Space

Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 117-120 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 79-81 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

The combined or successive effects of low pressure and G forces were investigated. The dynamics of development of symptoms of altitude decompression sickness were traced against the background of changing hydrostatic pressure due to acceleration. Altitude decompression sickness was induced in mongrel dogs. Animals with marked symptoms were divided into two groups. The natural outcome of the sickness was observed in one group, while the other group was rotated on a centrifuge. Results are discussed. J.M.S.

N80-10774# Joint Publications Research Service, Arlington, Va.
***INVESTIGATION OF ALVEOLOARTERIAL DIFFERENCE FOR* OXYGEN AND CARBON DIOXIDE WHEN BREATHING HIGH-DENSITY GAS MIXTURES** c52
I. A. Bryantsev, A. G. Dianov, V. V. Isayenko, A. V. Suvorov, and R. I. Finogenova *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 121-123 refs *Transl. into ENGLISH from Kosm. Biol. i* Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 81-83 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

Respiratory reactions to breathing high density gas mixtures were investigated using nonanesthetized animals. Respiration rate, minute volume, and oxygen and carbon dioxide concentration in alveolar air were determined using a capnograph and a gas analyzer. It is concluded that inclusion of inert gas of high density in respiratory mixtures, at normal atmospheric pressure, does not elicit any appreciable changes in transport of oxygen and carbon dioxide. J.M.S.

N80-10775# Joint Publications Research Service, Arlington, Va.
TOXIC EFFECTS OF CHEMICALS IN THE ALTERED GAS *ENVIRONMENT OF PRESSURIZED CHAMBERS* c54
G. I. Solomin *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 124-126 refs *Transl. into ENGLISH from Kosm. Biol. i Aviakosm.* Med. (Moscow), vol. 13, no. 5, 1979 p 83-84 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

The toxic effect of chemicals that are the products of gas emission from polymers on experimental animals in an altered gas environment were investigated in relation to spacecraft cabins. Studies were conducted with the use of 1,4-dioxane, ethyl acetate and isopropyl benzene. These agents are often identified in the air of manned compartments of spacecraft. Results are discussed. J.M.S.

N80-10776# Joint Publications Research Service, Arlington, Va.
EFFECT OF HYPOXIA ON ATPASE ACTIVITY OF THE BRAIN c52
I. B. Buravkova, E. S. Mailyan, and Ye. A. Kovalenko *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 127-131 refs *Transl. into* ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 85-87 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

Experiments were conducted on rats and mice in order to study the effect of hypoxia on ATPase activity of the brain. It is shown that an increase in activity is the most typical reaction of $Mg(2+)$-ATPase to acute hypoxia. Factors affecting enzyme activity include dissociation of oxidation and phosphorylation and activation of phospolipase A. J.M.S.

N80-10956# Joint Publications Research Service, Arlington, Va.
***THE THIRD SYSTEM OF REGULATION OF ANIMAL AND* HUMAN FUNCTIONS, THE ACTIVE POINT SYSTEM**
A. V. *Zhirmunskiy* (USSR Academy of Sciences, Vladivostok) and V. I. Kuzmin (USSR Academy of Sciences, Vladivostok) *In its* USSR Report: Biomedical and Behavioral Sci., No. 112 23 Jul. 1979 p 13-30 refs Transl. into ENGLISH from Zh. Obshchey Biologii (Moscow), no. 2, 1979 p 176-188 (For primary document see N80-10993 01-99)
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N80-10997# Joint Publications Research Service, Arlington, Va.
TWO IMPORTANT DIRECTIONS OF DEVELOPMENT OF SOVIET BIOMETRY
V. M. Shmidt (Leningrad State Univ.) *In its* USSR Report: Biomedical and Behavioral Sci., No. 112 23 Jul. 1979 p 31-46 refs Transl. into ENGLISH from Zh. Obshchey Biol. (Moscow), no. 2, 1979 p 219-228 (For primary document see N80-10993 01-99)
Copyright. Avail: NTIS HC A06/MF A01

N80-11001# Joint Publications Research Service, Arlington, Va.
ULTRASTRUCTURE OF CHLORELLA PYRENOIDOSA CELLS *(STRAIN p-11-1) FOLLOWING GROWTH UNDER CONDI*TIONS OF A PROLONGED SPACE FLIGHT
K. M. Sytnik (Academy of Sciences Ukrainian SSR, Kiev), Ye. L. *Kordyum (Academy of Sciences Ukrainian SSR, Kiev),* O. L. Mashynskyy (Academy of Sciences Ukrainian SSR, Kiev), A. F. Popova (Academy of Sciences Ukrainian SSR, Kiev), and H. M. *Hrechko (Academy of Sciences Ukrainian SSR, Kiev) In its* USSR Report: Biomedical and Behavioral Sci., no. 112 23 Jul. 1979 p 98-104 refs Transl. into ENGLISH from Dopovidi *Akad. Nauk Ukrayinskoyi RSR (Kiev), no. 4, 1979 p 311-315* (For primary document see N80-10993 01-99)
Avail: NTIS HC A06/MF A01

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N80-10777 *Rochester Univ., N. Y.*
USE OF THE PUPIL TO STUDY THE SCOTOPIC AND CHROMATIC MECHANISMS OF VISION IN HUMANS Ph.D. Thesis
Vasant Durgadas Saini 1979 361 p
Avail: Univ. Microfilms Order No. 7922982

Automated instrumentation was developed to conduct pupillometric experiments rapidly, accurately, and repeatably. Key features of the pupil light reflex were then studied, and its useful attributes were identified. A suitable procedure for measuring pupillary threshold was developed. It was verified that the pupil response to simple foveal flashes against a dark background was scotopic, but that other experiments indicated cone contribution to pupillary miosis. The unidirectional rate sensitivity of the pupil to retinal illumination was found to be a useful property of the pupil control system, and made it a convenient tool for studying the relationships between the scotopic and different chromatic channels of vision. This property was exploited, and a suitable model incorporating it was developed and used. Dissert. Abstr.

N80-10778* National Aeronautics and Space Administration, Washington, D. C.
***AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING* BIBLIOGRAPHY WITH INDEXES**
1979 63 p refs
(NASA-SP-7011(198)) HC A03 CSCL 06E

This bibliography lists 171 reports, articles, and other documents introduced into the NASA scientific and technical information system in September 1979. A.R.H.

N80-10779 *California Univ., Los Angeles.*
THE EXTENDED KALMAN FILTER AS PULMONARY BLOOD FLOW ESTIMATOR Ph.D. Thesis
Oleg Brovko 1979 276 p
Avail: Univ. Microfilms Order No. 7921375

The anesthetic uptake model was examined and developed to include dead space and shunt in the lung. The number of

body compartments was examined and a representative model for anesthetic uptake was chosen which is computationally manageable for the on-line algorithm. Ljung's formulation of the extended Kalman filter was compared with the optimal nonlinear filter and modified to estimate time-varying lung perfusion. The results were then generalized to a large class of nonlinear filtering problems which are of theoretical and practical interest. The algorithm accuracy, ability to follow lung perfusion changes, stability and robustness were examined and the technique was shown to be as accurate as thermal dilution in the clinical environment. These experiments establish the potential value of the on-line algorithm as an estimator of pulmonary blood flow during both steady and nonsteady states. Dissert. Abstr.

N80-10780 *Wayne State Univ., Detroit, Mich.*
A MODEL FOR AUDITORY EVOKED POTENTIALS Ph.D. Thesis
Peter Michael Nefcy 1979 282 p
Avail: Univ. Microfilms Order No. 7921705

Volume-conducted potentials from brain stem auditory structures were recorded from the scalp. These auditory evoked potentials (AEP) are due to neuronal activity from subcortical structures located in the brain stem, as well as the primary cortical areas. A mathematical model utilizing moving and fixed dipoles in a homogeneous volume-conducting medium was developed to simulate the response of the auditory system to acoustic clicks of intensity 60 dBSL during the first fifteen msec after stimulus delivery. The model demonstrates that the waves of the AEP can be generated from multiple sites in the brain stem. Various neurological disorders can be modeled with changes in the pathways, dipole magnitudes, and tract delays which reflect mechanisms of the disease processes. Dissert. Abstr.

N80-10781 *Pennsylvania State Univ., University Park.*
PLASMA VOLUME CHANGES IN FIT MEN AND WOMEN DURING A HUMID HEAT STRESS BEFORE AND AFTER AN ACCLIMATION Ph.D. Thesis
Janet Torma-Krajewski 1979 158 p
Avail: Univ. Microfilms Order No. 7922358

Plasma volume responses of fit men and women demonstrating similar maximum aerobic capacities were measured during a humid heat stress while walking on a treadmill at 30% maximal oxygen consumption. Prior to the acclimation no statistical differences in the core temperature, heart rate and blood pressure responses of the three groups were found. However, as judged by these responses, the observed trends indicated less strain in the pre-ovulation females when compared to the post-ovulation females and males. The females were better acclimated than the males as indicated by the rectal temperature responses. No statistical differences were observed in heart rate or blood pressure responses among the three groups. Dissert. Abstr.

N80-10782*# Pennsylvania State Univ., University Park.
KIDNEY CELL ELECTROPHORESIS Progress Report
Paul Todd Jun. 1979 25 p refs
(Contract NAS9-15584)
(NASA-CR-160353) Avail: NTIS HC A02/MF A01 CSCL 06B

A kidney cell electrophoresis technique is described in four parts: (1) the development and testing of electrophoresis solutions; (2) optimization of freezing and thawing; (3) procedures for evaluation of separated kidney cells; and (4) electrophoretic mobility characteristics of kidney cells. R.E.S.

N80-10783# *Naval Air Development Center, Warminster, Pa.* Aircraft and Crew Systems Technology Directorate.
THERMAL CONDUCTION EFFECTS IN HUMAN SKIN. PHASE 2: EXPERIMENTAL VALIDATION AND APPLICATION OF DATA IN SELECTION OF MATERIALS
A. M. Stoll, M. A. Chianta, and J. R. Piergallini 15 Jan. 1979 17 p refs
(Contract CPSC-C-77-0091; WF51523000)
(AD-A068480) Avail: NTIS HC A02/MF A01 CSCL 06/14

Experimental production of threshold blisters at material temperatures, and contact times predicted from measurements of pain thresholds validated the concept underlying this study, that is, that the relationship between pain and blister thresholds established earlier for radiant and for convective heating could be extended into the region appropriate to conductive heating to provide a simple factor by which to convert pain threshold contact times to threshold blister times. From the successful demonstration of this thesis, it is concluded that extrapolation of converted pain threshold temperature-time values determined empirically constitutes a reliable means of predicting maximum permissible temperature of materials for safe contact with bare skin. The information so derived, pertinent to areas of minimal epidermal thickness, is presented to chart form suitable for use in preselection of thermally safe construction and manufacturing materials. GRA

N80-10784# Wisconsin Univ. - Madison.
PULMONARY ADAPTATION TO HIGH ALTITUDE Annual Report, 1 Feb. - 31 Dec. 1978
Jerome A. Dempsey 22 Dec. 1978 20 p refs
(Contract DAMD17-77-C-7006; DA Proj. 3E1-61102-BS-08)
(AD-A068317) Avail: NTIS HC A02/MF A01 CSCL 06/19

This project is aimed at two closely related questions concerning man's adaptation to high altitude hypoxia: (1) What mechanisms regulate the ionic composition of brain intra- and extra-cellular fluid in long-term hypoxia; and (2) What role do these regulatory factors play in mediating ventilatory acclimatization to hypoxia; In the second year of our contract, we have accomplished the following: (a) found that CSF (H-) changed as a function of ventilation during normoxia deacclimatization from chronic hypoxia; (b) established the rat as an animal model for human ventilatory acclimatization to chronic hypoxia, and observed the relative insensitivity of ventilation to alkaline brain perfusion in chronic hypoxia; (c) established the near-perfect regulation of brain pHi in short-term hypoxia and/or hypocapnia and determined the contribution of changes in brain metabolism of this regulation; (d) established the necessary biochemical and physiologic methods and then showed a close link between CNS serotonin metabolism and the control of air-breathing eupnea in the awake rat; and (e) showed the difference in and importance of ventilatory adaptation in other physiologic states--sleep and exercise. GRA

N80-10785# *Oak Ridge National Lab., Tenn.*
NATIONAL LIBRARY OF MEDICINE TOXICOLOGY DATA BASE MANAGEMENT SYSTEM
J. S. Stanton and J. L. McNeany Apr. 1979 44 p
(Contract W-7405-eng-26)
(ORNL/CSD/TM-80) Avail: NTIS HC A03/MF A01

A data management system developed for the National Library of Medicine toxicology data base (TDB) is described. The TDB data management system includes features to handle initial data entry, data editing, generation of proof listings, and conversion of data to and from the MARK IV file management system's input format. DOE

N80-10786# Medical Coll. of Wisconsin, Milwaukee. Div. of Environmental and Occupational Medicine.
EFFECT OF A RAPID 4 PERCENT CARBOXYHEMOGLOBIN SATURATION INCREASE ON MAXIMAL TREADMILL EXERCISE
R. D. Stewart, P. E. Newton, J. Kaufman, H. V. Forster, J. P. Klein, M. H. Keelen, Jr., D. J. Stewart, A. Wu, and C. L. Hake 1978 46 p refs
(PB-296627/3; MCOW/ENVM/CO-78/2;
CRC-APRAC-CAPM-22-75) Avail: NTIS HC A03/MF A01 CSCL 06T

The effect and adaptation to this hypoxic stress over four hours was measured in six physically fit fire fighters. The subjects were randomly exposed and exercised to exhaustion in a double blind experiment to either carbon monoxide (CO) or uncontaminated air twice a week for three weeks. On exposure days the subjects breathed 20,000 ppm CO for 45 seconds, followed by 30 ppm CO for four hours. The rapid increase in COHb resulted in a decrease (p less than .05) in the mean exhaustion times obtained immediately after the CO bolus (745.2 to 736.3 sec). However, this small exercise decrement was not consistently observed, and in 16 of the 44 measurements the trained subjects performed better following CO exposure. GRA

N80-10787# *Ames Lab., Iowa.*
ANALYSIS OF AIRBORNE PARTICULATES AND HUMAN

URINE BY INDUCTIVELY COUPLED PLASMA-ATOMIC EMISSION SPECTROMETRY

Kenneth W. Olson, William J. Haas, Jr., and Velmer A. Fassel Oct. 1978 123 p refs Sponsored by HEW (PB-297775/9; NIOSH-79/110) Avail: NTIS HC A06/MF A01 CSCL 06T

The results of sampling and multielement analysis of trace elements found in urine of workers and in workplace environments are presented. Inductively coupled plasma-atomic emission spectrometry (ICP-AES) was used to investigate both direct and indirect analysis schemes for air particulates. A unique facility was developed and used for the preparation of air particulate standard reference materials and is described. A complete sampling and ICP-AES analytical method for the simultaneous determination of trace elements typically present in urine samples was also developed and characterized. GRA

N80-10749# Joint Publications Research Service, Arlington, Va.

PROBLEMS OF PHARMACOLOGY IN SPACE MEDICINE

V. S. Shaskov and B. B. Yegorov *In its* USSR Report: Biomedical and Behavioral Sci., No. 122 12 Oct. 1979 p 1-20 refs Transl. into ENGLISH from Farmakol. Toksikol. (USSR), no. 4, 1979 p 325-339 (For primary document see N80-10748 01-51)
Avail: NTIS HC A07/MF A01

N80-10753# Joint Publications Research Service, Arlington, Va.

CURRENT CONCEPTIONS ON THE GENESIS OF VESTIBULOVEGETATIVE DISORDERS IN WEIGHTLESSNESS

B. I. Polyakov *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 1-12 refs Transl. into ENGLISH of Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 3-10 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

N80-10754# Joint Publications Research Service, Arlington, Va.

EFFECT OF HYPOXIA ON FLUID-ELECTROLYTE METABOLISM AND RENAL FUNCTION IN MAN AS RELATED TO DIFFERENT DEGREES OF MOTOR ACTIVITY

A. I. Grigoryev, V. I. Korolkov, G. I. Kozyreyskaya, and M. A. Dotsenko *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 13-18 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 10-14 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

N80-10757# Joint Publications Research Service, Arlington, Va.

AGE-RELATED DISTINCTIONS OF CHANGES IN PSYCHOPHYSIOLOGICAL FUNCTIONS OF PILOTS IN THE CIVIL AVIATION UNDER THE INFLUENCE OF VIBRATION AND NOISE

Yu. N. Kamenskiy and Ye. A. Sokolova *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 30-34 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 21-24 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

N80-10759# Joint Publications Research Service, Arlington, Va.

ROENTGENOLOGICAL EXAMINATION OF THE HUMAN HEART AFTER 100-DAY HYPOKINESIA

I. G. Krasnych *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 40-44 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 28-31 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

N80-10763# Joint Publications Research Service, Arlington, Va.

THE COMBINED EFFECT OF CARBON MONOXIDE AND HYPOKINESIA

B. I. Abidin, V. V. Kustov, V. I. Belkin, and A. N. Kondratyev *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 63-68 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 44-48 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

N80-10764# Joint Publications Research Service, Arlington, Va.

LEVELS AND PROPORTION OF RNA AND PROTEINS IN THE SYSTEM OF THE NEURON: VESTIBULAR NUCLEAR NEUROGLIA AND CEREBELLUM DURING HYPOKINESIA

L. M. Mamalyga *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 69-75 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 49-53 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

N80-10765# Joint Publications Research Service, Arlington, Va.

SOME HEMODYNAMIC PARAMETERS DURING RESPIRATION OF OXYGEN UNDER EXCESSIVE PRESSURE

K. I. Murakhovskiy and L. I. Letkova *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 76-81 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 53-57 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

N80-10767# Joint Publications Research Service, Arlington, Va.

AMOUNT OF MICROORGANISMS DISCHARGED FROM THE UPPER RESPIRATORY TRACT AND INTEGUMENT OF PEOPLE CONFINED IN A SEALED CHAMBER

S. N. Zaloguyev, A. N. Viktorov, K. V. Zarubina, and V. P. Gorshkov *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 88-92 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 61-65 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

N80-10768# Joint Publications Research Service, Arlington, Va.

ULTRASTRUCTURAL CHANGES IN CANINE HEPATOCYTES DURING CONTINUOUS CHRONIC EXPOSURE TO LOW DOSES OF GAMMA RADIATION

L. A. Bespalova, V. V. Shikhodyrov, and V. S. Romanov *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 93-99 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 65-69 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

N80-10770# Joint Publications Research Service, Arlington, Va.

A METHOD OF DEFINING THE OPTIMUM LEVEL OF IONIZING RADIATION FROM DETERMINATE SOURCES DURING SPACE FLIGHTS

A. V. Kolomenskiy and V. A. Sakovich *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 106-110 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 74-76 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

N80-10771# Joint Publications Research Service, Arlington, Va.

PSYCHOPROPHYLAXIS OF FATIGUE AND FUNCTIONAL CARDIOVASCULAR DISEASES IN PILOTS BY MEANS OF SELF-CONDITIONING

A. N. Gurov *In its* USSR Report: Space Biol. and Aerospace

Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 111-113 *refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 77-78* (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

N80-10772# *Joint Publications Research Service, Arlington, Va.*
USE OF SHORT-ARM CENTRIFUGE TO PREVENT DECONDITIONING WHEN IMMERSED IN WATER (ACCORDING TO H-REFLEX)
B. I. Zborovskaya *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 114-116 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 78-79 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

N80-10774# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF ALVEOLOARTERIAL DIFFERENCE FOR OXYGEN AND CARBON DIOXIDE WHEN BREATHING HIGH-DENSITY GAS MIXTURES
I. A. Bryantsev, A. G. Dianov, V. V. Isayenko, A. V. Suvorov, and R. I. Finogenova *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 *p 121-123 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979* p 81-83 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

N80-10776# Joint Publications Research Service, Arlington, Va.
EFFECT OF HYPOXIA ON ATPASE ACTIVITY OF THE BRAIN
I. B. Buravkova, E. S. Mailyan, and Ye. A. Kovalenko *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 *p 127-131 refs Transl. into* ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 85-87 (For primary document see N80-10752 01-51)
Avail: NTIS HC A07/MF A01

N80-10995# *Joint Publications Research Service, Arlington, Va.*
HEALTH PROGNOSIS IN FLIGHT DISCUSSED
R. Bayevskiy In its USSR Report: Biomedical and Behavioral Sci., No. 112 23 Jul. 1979 p 10-12 Transl. into ENGLISH from Meditsinskaya Gazeta (Moscow), 30 May 1979 *p 3* (For primary document see N80-10993 01-99)
Avail: NTIS HC A06/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N80-10788# Civil Aeromedical Inst., Oklahoma City, Okla.
THE DEVELOPMENT OF THE ATC SELECTION BATTERY: A NEW PROCEDURE TO MAKE MAXIMUM USE OF AVAILABLE INFORMATION WHEN CORRECTING CORRELATIONS FOR RESTRICTION IN RANGE DUE TO SELECTION
James O. Boone and Mary A. Lewis Sep. 1978 46 p refs
(AD-A066132; FAA-AM-78-36) Avail: NTIS HC A03/MF A01 CSCL 05/9

A five test selection battery is currently given to select the air traffic controllers. Data was collected on two new tests being considered for incorporation into the battery. To determine the utility of the old and new tests, it is necessary to correlate the tests with a criterion of job success. However, since criterion information is available only on persons already selected for air traffic control work, the correlation is restricted to this upper range of persons, and is, thereby, spuriously low for prediction purposes. To properly evaluate the utility of the tests, the correlation must be corrected for this restriction in range. A new procedure that was developed to more accurately correct correlations for restriction in range is described. The new procedure was compared with Gulliksen and Thorndike's procedures by the Monte Carlo method and was shown to be more accurate. R.E.S.

N80-10789# Washington Univ., Seattle. Dept. of Psychology.
LIFE STRESS, SELF-PREOCCUPATION, AND SOCIAL SUPPORTS
Irwin G. Sarason 15 Apr. 1979 49 p *refs Presented at* meeting of the Western Psychological Assoc., San Diego, Calif., 6 Apr. 1979
(Contract N00014-75-C-0905; NR Proj. 170-804)
(AD-A068624; SCS-LS-008) Avail: NTIS HC A03/MF A01 CSCL 05/10

A theoretical framework for stress research is presented which emphasizes the role of cognitions related to situational demands, constraints, and opportunities. The nature of these cognitions is influenced by personality characteristics, recent life experiences, and social supports. Relevant research dealing with these factors is reviewed. Two studies in which elements of social supports were experimentally manipulated are described. Their clinical and developmental implications are discussed. GRA

N80-10790# Human Factors Research, Inc., Goleta, Calif.
RESEARCH ON THE PSYCHOPHYSIOLOGICAL BASIS OF HUMAN VIGILANCE Final Report, 1968 - 1978
James F. O'Hanlon, Jr. Apr. 1979 17 p refs
(Contract N00014-68-C-0296; NR Proj. 201-052)
(AD-A068562; TR-787-F) Avail: NTIS HC A02/MF A01 CSCL 05/10

The research products of a program of studies directed at identifying the psychophysiological basis of human vigilance are briefly summarized. Much of the work focused on identifying the relationship between the biogenic catecholamines, adrenaline (A) and noradrenaline (NA), and human vigilance. A new fluorometric assay for subnanogram concentrations of (A) and (NA) was developed. Several studies were performed showing substantial correlations between vigilance performance and circulating concentrations of (A). It was shown that vigilance could be increased through pulsatile infusions of (A). Vigilance was shown to be adversely affected by typical urban concentrations of carbon monoxide (CO) and by hypoxia experienced at high altitudes. It was also shown that vigilance decrements occur not only with typical laboratory tasks (used early in the program) but also with realistic radar monitoring tasks. Target detection performance, using a typical radar PPI, was shown to deteriorate over time as excretion rates of (A) decreased. Concurrent monitoring of the EEG showed that the performance decrement was also accompanied by a decreased percentage of Beta and increased percentage of Alpha and Theta. GRA

N80-10791# Yale Univ., New Haven, Conn. Dept. of Psychology.
AN APTITUDE-STRATEGY INTERACTION IN LINEAR SYLLOGISTIC REASONING Research Report, 1 Jan. - 30 Mar. 1979
Robert J. Sternberg and Evelyn M. Weil 1 Apr. 1979 51 p refs
(Contract N00014-78-C-0025; NR Proj. 150-412)
(AD-A068498; RR-1-79; TR-15) Avail: NTIS HC A04/MF A01 CSCL 05/10

The major goal of the present study was to demonstrate an aptitude-strategy interaction in linear syllogistic reasoning. Specifically, it was hypothesized that the efficiency of each of four alternative strategies for solving linear syllogisms--problems such as 'John is taller than Bill; Bill is taller than Pete' who is tallest?'--would depend upon subjects' patterns of verbal and spatial abilities. This hypothesis was confirmed. The research also had three subsidiary goals. The first was to determine whether it is possible to train subjects to use various classes of strategies for solving linear syllogisms. It was found that such training is possible. The second goal was to determine whether certain strategies for solving linear syllogisms might be more efficient on the average than others. It was found that one strategy, used spontaneously by only a small minority of subjects but rather easily trainable, is more efficient than alternative strategies that subjects seem to use. The third goal was to provide a series of converging operations for testing the validity of one

particular account of linear-syllogistic reasoning--a spatial-linguistic mixture model--for subjects receiving no explicit instruction in the solution of linear syllogisms. The validity of this model for the untrained subjects was upheld. It was concluded that componential analysis, a series of conceptual and methodological techniques for investigating intelligent performance, can provide a useful means for studying interactions between aptitudes and experimental treatments. GRA

N80-10792# California Univ., San Diego, La Jolla. Center for Human Information Processing.

A STUDY OF COMPLEX LEARNING THEORY AND METHODOLOGIES

Ross A. Bott Mar. 1979 88 p

(Contract N00014-76-C-0628; ARPA Order 2284; NR Proj. 154-387)

(AD-A068323; REPT-7901) Avail: NTIS HC A05/MF A01 CSCL 05/10

This paper presents an analysis and model of the cognitive processes underlying complex learning situations. A theory is proposed that attempts to specify particular internal knowledge structures generated and modified during instruction, and to use them to explain specific difficulties that the learner experiences and also the overall progress being made. The theory states that (1) the underlying process reflects largely the prior knowledge structures of the student interacting with the information implied by the instruction; (2) the learning mechanisms involved are mostly simple and automatic; (3) the key information within the knowledge structures which allows complex learning to occur is the similarity between higher-order structures. This theory was applied to novices learning to use a computer text editor by reading a basic instruction manual and completing some exercises. After each sentence of instruction, they were asked to describe their current understanding, any difficulties they were aware of, and their expectations about what would follow. Their protocols were analyzed for evidence of underlying cognitive processes. These learning processes and the associated knowledge structures on which they operate were then modeled in terms of the theory at several levels of detail. Several issues of knowledge representation related to the model are discussed and possible solutions proposed. GRA

N80-10793# Naval Ocean Systems Center, San Diego, Calif.

REMOTE OPERATOR PERFORMANCE COMPARING MONO AND STEREO TV DISPLAYS: THE EFFECTS OF VISIBILITY, LEARNING AND TASK FACTORS Final Report

D. C. Smith, R. E. Cole, J. O. Merritt, and R. L. Pepper Feb. 1979 45 p refs

(RR04207)

(AD-A068201; NOSC/TR-380) Avail: NTIS HC A03/MF A01 CSCL 05/10

An analysis of visual perception related to the underwater environment is presented, followed by a discussion of 3-dimensional space perception, and the absolute and relative cues employed by the operator during task performance. Using a category 1 task, experiment 1 employed highly practiced subjects to reduce the effects of learning. Mono and stereo TV performance was measured under three levels of visibility degradation (simulated by contrast reduction). As predicted, stereo was superior to mono under all conditions tested. Performance using both mono and stereo displays were both affected by degraded visibility. Experiment 2 was conducted with naive subjects using an experimental design which enabled an assessment of the degree of learning under operator testing conditions. We hypothesized that the category 1 task would show significantly less advantage for stereo, but that the effects of degraded visibility would continue to occur. The results are consistent with our interpretation. In experiment 3, the more visually complex category 2 task was employed. The design of the experiment was similar to experiment 2 so that evidence for learning could be assessed under these different conditions. Predictions concerning the degree of performance advantage for stereo vs mono displays were supported. This advantage was observed to increase with decreasing visibility, a finding which is consistent with our earlier predictions. GRA

N80-10794# City Univ. of New York, N. Y. Dept. of Psychology.

EVOKED CORTICAL POTENTIALS AND INFORMATION PROCESSING Annual Report, 1 Jan. 1978 - 30 Jun. 1979

John L. Andreassi, Joseph A. Gallichio, and Nancy E. Young 30 Jun. 1979 104 p refs

(Contract N00014-77-C-0114)

(AD-A070789; AR-16) Avail: NTIS HC A05/MF A01 CSCL 05/2

In summary, the present findings show that there are perceptual differences between continuous and apparent motion and that these differences may be reflected in the latency and amplitude of the VEP. Furthermore, theoretical and cell system models were presented to account for the observed differences. These models propose that continuous motion is processed by specialized motion detecting cells which may respond to velocity as an intensity factor in motion. In apparent motion, the models suggest that cells would respond to the spatial and temporal change in position over time aspects of this type of motion and the role of velocity as an intensity factor would be diminished. Thus, it is suggested that future studies be undertaken to compare continuous and apparent motion using a wider range of velocity conditions and recording locations. Also, the direction of motion should be systematically examined for both continuous and apparent motion. GRA

N80-10795# Oklahoma Univ., Norman. Decision Processes Lab.

A MEMORY RETRIEVAL AID FOR HYPOTHESIS GENERATION Progress Report, Aug. 1978 - Aug. 1979

Charles Gettys, Tom Mehle, Suzanne Baca, Stanley Fisher, and Carol Manning 27 Jul. 1979 37 p refs

(Contract N00014-77-C-0615; NR PROJ. 197-040)

(AD-A072657; TR-27-7-79) Avail: NTIS HC A03/MF A01 CSCL 05/10

This study investigates an aid for the hypothesis retrieval process which is based on a model for hypothesis retrieval developed by Gettys, Fisher, and Mehle (1978). A computer simulates the human hypothesis retrieval process by searching an enriched associative memory which contains the associations of a number of individuals in the form of a list of hypotheses for each datum. When the data of a decision problem become known, the appropriate lists are searched by the computer. Hypotheses that are common to most or all of the lists are suggested to the user, who assesses them for plausibility. An experiment was performed to determine the utility of the aid for both expert and non-expert users. The aid produced a substantial gain in performance for both groups of users, suggesting that further development of the aid would be worthwhile in decision situations which are repeated often enough to warrant the creation of an enhanced artificial memory. Also discussed are several techniques for implementing the aid, and determining the maximum gain in performance that the aid can produce. GRA

N80-10796# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

MODALITY EFFECTS IN SCANNING NONVERBAL INFORMATION: EVIDENCE FOR MULTIPLE MEMORY CODES Ph.D. Thesis

R. L. Hann Jun. 1979 74 p refs

(AF PROJ. 7184)

(AD-A072297; AMRL-TR-79-53) Avail: NTIS HC A04/MF A01 CSCL 05/2

The purpose of this experiment was to study memory coding processes as a function of input sensory modality. Some investigators have proposed a single auditory/articulatory code, regardless of stimulus modality, while others have suggested that multiple sensory-specific codes are generated. Subjects in this study learned to associate 10 twelve-sided random polygons with ten complex sounds. These paired associates were then used in several versions of a Sternberg binary choice reaction time task. Results indicated that subjects were able to maintain sensory-specific memory information when it was advantageous to do so. The observed effects were best interpreted in terms of a multiple-code model, in which both a primary (same-modality) code and a weaker associate (opposite-modality) code are simultaneously generated as the to-be-remembered information is input. GRA

N80-10797# Sandia Labs., Albuquerque, N. Mex.
SUMMARY OF PROJECT TO DEVELOP HANDBOOK OF HUMAN RELIABILITY ANALYSIS FOR NUCLEAR POWER PLANT OPERATIONS
A. D. Swain 12 Sep. 1978 25 p refs
(Contract EY-76-C-04-0789)
(SAND-78-1812C; Conf-781146-1) Avail: NTIS HC A02/MF A01

A handbook to aid qualified persons to evaluate the effect of human error on the availability of engineered safety systems and features in nuclear power plants is described. The handbook includes a mathematical model, procedures, derived human failure data, and principles of human behavior and ergonomics. DOE

N80-10798# California Univ., Livermore. Lawrence Livermore Lab.
HUMAN VIGILANCE INVESTIGATION ANALYSIS OF THE PATTERN ARRAY TEST (FURTHER DATA ANALYSIS) Final Report
Andrew C. Have Apr. 1979 68 p refs Prepared in cooperation with Calif. Polytechnic State Univ., San Luis Obispo
(Contract W-7405-eng-48)
(UCRL-13891-3) Avail: NTIS HC A04/MF A01

A test which is designed to help solve problems of human vigilance encountered in a material safeguard system is presented. The efficiency of an operator is measured when large amounts of information are being processed from a video screen over extended periods of time. For the test, eight objects, either circles, squares, or triangles, are set in a 5 x 5 matrix which appeared on a video screen. The eight objects are shown for a specified length of time, blanked out for another specified period, and then eight objects are again shown in the same 5 x 5 matrix. The observer is tested on his ability to discern changes in patterns and/or symbols from frame to frame. It was found that changes in pattern were more easily identified than changes in symbols. DOE

N80-10574*# Texas Univ. at Austin.
SOUTH AMERICAN RIVER MORPHOLOGY AND HYDROLOGY
R. K. Holz, V. R. Baker, S. M. Sutton, Jr., and M. M. Penteado-Orellana (Fundacao Univ. de Brasilia) *In* NASA. Johnson Space Center Apollo-Soyuz Test Project, Vol. 2 1979 p 545-594 refs (For primary document see N80-10538 01-43)
Avail: NTIS HC A99/MF A01

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N80-10799* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PORTABLE BREATHING SYSTEM Patent
John S. Lovell, inventor (to NASA) (United Technologies Corp., East Hartford, Conn.) Issued 25 Sep. 1979 8 p Filed 24 Mar. 1977 Supersedes N77-21847 (15 - 12, p 1643) Sponsored by NASA
(NASA-Case-MSC-16182-1; US-Patent-4,168,706; US-Patent-Appl-SN-780938; US-Patent-Class-128-142R; US-Patent-Class-128-191R; US-Patent-Class-128-212) Avail: US Patent and Trademark Office CSCL 06K

A semiclosed-loop rebreathing system is discussed for use in a hostile environment. A packed bed regenerative heat exchanger providing two distinct temperature humidity zones of breathing gas with one zone providing cool, relatively dry air and the second zone providing hot, moist air is described.
A.W.H.

N80-10800*# Life Systems, Inc., Cleveland, Ohio.
EXTENDED DURATION ORBITER STUDY: CO2 REMOVAL AND WATER RECOVERY Final Report
R. D. Marshall, G. S. Ellis, F. H. Schubert, and R. A. Wynveen May 1979 91 p refs
(Contract NAS9-15218)
(NASA-CR-160317; LSI-ER-319-24) Avail: NTIS HC A05/MF A01 CSCL 06K

Two electrochemical depolarized carbon dioxide concentrator subsystems were evaluated against baseline lithium hydroxide for (1) the baseline orbiter when expanded to accommodate a crew of seven (mission option one), (2) an extended duration orbiter with a power extension package to reduce fuel cell expendables (mission option two), and (3) an extended duration orbiter with a full capability power module to eliminate fuel cell expendables (mission option three). The electrochemical depolarized carbon dioxide concentrator was also compared to the solid amine regenerable carbon dioxide removal concept. Water recovery is not required for Mission Option One since sufficient water is generated by the fuel cells. The vapor compression distillation subsystem was evaluated for mission option two and three only. Weight savings attainable using the vapor compression distillation subsystem for water recovery versus on-board water storage were determined. Combined carbon dioxide removal and water recovery was evaluated to determine the effect on regenerable carbon dioxide removal subsystem selection. R.E.S.

N80-10801*# Life Systems, Inc., Cleveland, Ohio.
PREPROTOTYPE VAPOR COMPRESSION DISTILLATION SUBSYSTEM Final Report
George S. Ellis, R. A. Wynveen, and F. H. Schubert Aug. 1979 69 p
(Contract NAS9-15267)
(NASA-CR-160332; LSI-ER-312-4) Avail: NTIS HC A04/MF A01 CSCL 06K

A three-person capacity preprototype vapor compression distillation subsystem for recovering potable water from waste-water aboard spacecraft was designed, assembled, and tested. The major components of the subsystem are: (1) a distillation unit which includes a compressor, centrifuge, central shaft, and outer shell; (2) a purge pump; (3) a liquids pump; (4) a post-treat cartridge; (5) a recycle/filter tank; (6) an evaporator high liquid level sensor; and (7) the product water conductivity monitor. A computer based control monitor instrumentation carries out operating mode change sequences, monitors and displays subsystem parameters, maintains intramode controls, and stores and displays fault detection information. The mechanical hardware occupies 0.467 m3, requires 171 W of electrical power, and has a dry weight of 143 kg. The subsystem recovers potable water at a rate of 1.59 kg/hr, which is equivalent to a duty cycle of approximately 30% for a crew of three. The product water has no foul taste or odor. Continued development of the subsystem is recommended for reclaiming water for human consumption as well as for flash evaporator heat rejection, urinal flushing, washing, and other on-board water requirements. K.L.

N80-10802# Logicon, Inc., San Diego, Calif.
DESIGN CONSIDERATIONS FOR THE MAN-MACHINE RELATIONS USER INTERFACE TO TAS Interim Technical Report, 15 Mar. - 15 Jul. 1979
15 Jul. 1979 134 p
(Contract MDA903-79-C-0261; ARPA Order 3705)
(AD-A071207) Avail: NTIS HC A07/MF A01 CSCL 09/2

This effort consists of the analysis and design of a user interface which employs several man-machine relations factors; an existing system will be employed as a testbed for these beliefs - the COINS II Terminal Access System (TAS). This new interface must not interfere with the existing TAS user interface; it must coexist with the original and both must be accessible to TAS users. In addition to the software effort, intelligent terminals (i.e., microprocessor controlled) will emulate an electronic desk environment for the user. We feel that such modifications will result in greatly increased user acceptance of TAS, while providing a good indication of how such considerations can be applied to other systems and the possible effects of such efforts. GRA

N80-10803# Anthropology Research Project, Yellow Springs, Ohio.
REVISED HEIGHT/WEIGHT SIZING PROGRAMS FOR MEN'S PROTECTIVE FLIGHT GARMENTS
Milton Alexander, John T. McConville, and Ilse Tebbetts Wright-Patterson AFB, Ohio AMRL Apr. 1979 117 p refs
(Contract F33615-78-C-0508; AF Proj. 7184)

(AD-A070732; AMRL-TR-79-28) Avail: NTIS HC A06/MF A01 CSCL 06/14

Presented in this report is an updated series of height/weight sizing programs for use by designers of protective clothing for USAF men. The sizing values are based on an analysis of data obtained in the 1967 survey of flying personnel and cover some 71 dimensions (excluding head, hand and foot measurements.)

GRA

N80-10804# Rockwell International Corp., Columbus, Ohio. Autonetics Missile Systems Div.

VISUAL SEARCH PERFORMANCE IN SIMULATED REMOTELY PILOTED VEHICLE UTILIZATION AS A FUNCTION OF AUXILIARY TASK LOADING ON THE OBSERVER Final Report, 25 Aug. 1975 - 3 May 1976

Richard B. Huntoon, Benjamin Schohan, and Uldi Shvern Apr. 1979 65 p refs

(Contract DAHC19-76-C-0011)

(AD-A072402; ARI-TR-357) Avail: NTIS HC A04/MF A01 CSCL 05/5

Baseline data were obtained on how well observers could extract information from a TV monitor while performing auxiliary tasks under task loading conditions that might be encountered in use of a remotely piloted vehicle (RPV) as the sensor platform. A simulation facility was used. It contained a terrain model, a TV camera transport, hybrid computing equipment, and a television display and control console. Six pilots and six nonpilots participated in the three-phase effort. Phase A required participants to detect and recognize tank-sized targets in open and cluttered backgrounds from a simulated altitude of 2,000 feet and a simulated RPV velocity of 100 knots. Phase B required participants to monitor and correct deviations in the RPV course and altitude and to respond to two visual warning indicators. Increasing the auxiliary load level decreased the probabilities and ranges of target detection and recognition. Target acquisition task demands similarly increased auxiliary task response times. Cluttered background significantly degraded target acquisition task performance, particularly when the auxiliary task was performed concurrently.

GRA

N80-10750# Joint Publications Research Service, Arlington, Va.

A PORTABLE STAND FOR ASSESSING THE DYNAMICS OF A WORKING INDIVIDUAL'S FUNCTIONAL STATE

A. B. Leonova and V. G. Romanyuta *In its* USSR Report: Biomedical and Behavioral Sci., No. 122 12 Oct. 1979 p 41-48 refs Transl. into ENGLISH from Tekhnicheskaya estetika (USSR), no. 7, 1979 p 24-26 (For primary document see N80-10748 01-51)

Avail: NTIS HC A07/MF A01

N80-10758# Joint Publications Research Service, Arlington, Va.

DIETARY SUPPLEMENTS USED TO PREVENT SOME CHANGES IN THE HUMAN BODY IN THE PRESENCE OF NERVOUS AND EMOTIONAL STRESS

V. P. Bychkov and M. V. Markaryan *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 35-39 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 25-28 (For primary document see N80-10752 01-51)

Avail: NTIS HC A07/MF A01

N80-10766# Joint Publications Research Service, Arlington, Va.

BICHROMATE OXIDABILITY AS A CRITERION OF QUANTITATIVE LEVELS OF ORGANIC IMPURITIES IN RECLAIMED WATER

V. A. Kryuchkov and N. S. Mareyeva *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 82-87 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 57-61 (For primary document see N80-10752 01-51)

Avail: NTIS HC A07/MF A01

N80-10769# Joint Publications Research Service, Arlington, Va.

RUSH NUTS (CYPERUS ESCULENTUS) AS A SOURCE OF VEGETABLE OIL IN A CLOSED LIFE SUPPORT SYSTEM

M. P. Shilenko, G. S. Kalacheva, G. M. Lisovskiy, and I. N. Trubachev *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 100-105 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 70-74 (For primary document see N80-10752 01-51)

Avail: NTIS HC A07/MF A01

N80-10775# Joint Publications Research Service, Arlington, Va.

TOXIC EFFECTS OF CHEMICALS IN THE ALTERED GAS ENVIRONMENT OF PRESSURIZED CHAMBERS

G. I. Solomin *In its* USSR Report: Space Biol. and Aerospace Med., Vol. 13, No. 5 (JPRS-74470) 29 Oct. 1979 p 124-126 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), vol. 13, no. 5, 1979 p 83-84 (For primary document see N80-10752 01-51)

Avail: NTIS HC A07/MF A01

N80-11000# Joint Publications Research Service, Arlington, Va.

EVALUATION OF HEAT FLOW COMPONENTS FROM HEATER TO SKIN IN AN ELECTRIC THERMAL SUIT

I. M. Naumenko (Academy of Sciences Ukrainian SSR, Kiev) *In its* USSR Report: Biomedical and Behavioral Sci., No. 112 23 Jul. 1979 p 76-80 refs Transl. into ENGLISH from Dopovidi Akad. Nauk Ukrayinskoyi RSR (Kiev), no. 4, 1979 p 294-297 (For primary document see N80-10993 01-99)

Avail: NTIS HC A06/MF A01

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see 33 Electronics and Electrical Engineering.

N80-10805# Maryland Univ., College Park. Computer Science Center.

A SYSTEM FOR CONTROL STRUCTURE IMPLEMENTATION FOR IMAGE UNDERSTANDING

Martin Herman Mar. 1978 26 p refs

(Contract DAAG53-76-C-0138; ARPA Order 3206)

(AD-A071603; TR-646) Avail: NTIS HC A03/MF A01 CSCL 09/2

A data base system with inferencing capabilities is described. This system, developed by C. Rieger, is investigated as a tool in support of control structure implementation for image understanding.

GRA

NBO-10806# *Naval Postgraduate School, Monterey, Calif.*
NPS-PASCAL: A PASCAL IMPLEMENTATION FOR MICROPROCESSOR-BASED COMPUTER SYSTEMS M.S. Thesis
John L. Byrnes Jun. 1979 283 p refs
(AD-A071972) Avail: NTIS HC A13/MF A01 CSCL 09/2

NPS-PASCAL is a Naval Postgraduate School research project whose goal is the implementation of the PASCAL programming language on a microprocessor-based system. The NPS-PASCAL compiler consists of two software subsystems, the first analyzes the source program and produces a machine-independent intermediate form, while the second produces target machine code. The system is designed to satisfy the constraints of Standard Pascal, as defined by the British Standards Institute/International Standards Organization Working Draft of Standard Pascal. GRA

NBO-10807# Army Missile Research and Development Command, Redstone Arsenal, Ala. Technology Lab.
APPLICATION OF A MICROPROGRAMMED, BIT SLICE MICROPROCESSOR TO THE REAL TIME IMAGING TRACKER PROBLEM
Lewis G. Minor 30 Sep. 1978 252 p refs
(AD-A071638; DRDMI-T-78-53) Avail: NTIS HC A12/MF A01 CSCL 09/2

Following sections detail the design and construction of an imaging tracker built inhouse. The program was very successful and nearly all of the objectives in the original scope of work were achieved. The program's major accomplishments are listed as follows: (1) Designed, built, and tested the first Army imaging tracker capable of correlation and adaptive gate optical contrast tracking. (2) the feasibility of trackers using high speed microprocessors and CCD TV technology was demonstrated. (3) several correlation and template matching techniques were studied and implemented in real time microprocessors. Though the tracker was built primarily as a research tool, the hardware concept has the potential for achieving a very small packaging size. GRA

NBO-10808# Massachusetts Inst. of Tech., Cambridge. Center for Information Systems Research.
ANALYSIS TECHNIQUES FOR USE WITH THE EXTENDED SDM MODEL
S. L. Huff and S. E. Madnick May 1979 126 p refs
(Contract N00039-78-G-0160)
(AD-A071647; CISR-P010-7905-09; CISR-TR-9) Avail: NTIS HC A07/MF A01 CSCL 09/2

Complex design problems are characterized by a multitude of competing requirements. System designers frequently find the scope of the problem beyond their conceptual abilities, and attempt to cope with this difficulty by decomposing the original design problem into smaller, more manageable sub-problems. Functional requirements form a key interface between the users of a system and its designers. In this research effort, a systematic approach has been proposed for the decomposition of the overall set of functional requirements into sub-problems to form a design structure that will exhibit the key characteristics of good design: strong coupling within sub-problems, and weak coupling between them. Recent work in the Systematic Design Methodology project has led to certain extensions to the basic representational model used therein. This report presents new analytical mechanisms that may be used to execute decomposition analyses in the context of the extended model. Included are new methods for calculating inter-requirement similarities, for measuring decomposition goodness, and for generating clustering hierarchies. As well, some new hierarchical clustering tools are presented, with examples. A complete analysis of a 22-node design problem is presented, and compared with results obtained for the same problem in earlier work using the original SDM. GRA

NBO-10809# Naval Postgraduate School, Monterey, Calif.
CONVERGENCE ZONE PREDICTION MODELS WITH PROGRAMS FOR USE ON HP-67 AND HP-97 PROGRAMMABLE CALCULATORS M.S. Thesis
Richard L. Badger Mar. 1979 100 p refs
(AD-A072050) Avail: NTIS HC A05/MF A01 CSCL 09/2

Convergence zone (CZ) prediction models are developed based on acoustic ray tracing theory as applied to linearly segmented sound velocity profiles (SVP). The models were developed into three calculator programs, two for CZ range predictions under different source and receiver depth conditions and one for CZ gain and transmission loss (TL) predictions. The performance of the models as programmed on Hewlitt-Packard HP-67 or HP-97 programmable calculators was compared to the Fast Asymptotic Coherent Transmission (FACT) model which is based on similar but more elaborate theory and which is designed for use on large digital computers. Agreement of the calculator programs with the FACT model is fairly good when conditions are within the design limitations of the programs and environmental conditions are not unusual. GRA

NBO-10810# *Naval Postgraduate School, Monterey, Calif.*
A TACTICAL SYSTEM EMULATOR FOR A DISTRIBUTED MICRO-COMPUTER ARCHITECTURE M.S. Thesis
Luis A. Guillen Jun. 1979 325 p refs
(AD-A072578) Avail: NTIS HC A14/MF A01 CSCL 09/2

An emulator is constructed in order to study the behaviour of a Tactical System in a distributed micro-computer architecture environment. This emulator represents Tactical Systems as a set of periodic and demand scheduled functional module processes that collaborate with each other. A special purpose operating system was implemented for the distributed micro-computer architecture that supports the emulator. It includes processor management and system wide input/output capabilities. GRA

NBO-10811# *Ames Lab., Iowa.*
SPECIAL PURPOSE COMPUTER TO COMPUTER INTERFACE M.S. Thesis
B. F. Carter, III Jan. 1979 56 p refs
(Contract W-7405-eng-82)
(IS-T-830) Avail: NTIS HC A04/MF A01

The specific design criteria for interfacing two dissimilar computers are presented. The discussion also includes hardware and software protocol for communication between the systems. DOE

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

NBO-10812 Utah State Univ., Logan.
A METHOD OF COMPUTER-AIDED GENERATION OF SOFTWARE FOR DIGITAL SYSTEM CONTROLLERS USING FIXED-INSTRUCTION MACHINES Ph.D. Thesis
Mark Leonard Manwaring 1979 198 p
Avail: Univ. Microfilms Order No. 7917972

A method of applying a general purpose high-level language to the writing of software for digital system controllers which are implemented with fixed-instruction machines is presented. Several hardware configurations for synchronous digital system controllers are presented. Each of these fit the model of a Mealy or Moore sequential machine. An example of a programmable sequential machine applicable to the digital control process is presented. This microprogrammable machine may be converted to a fixed-instruction programmable machine. The concept of state of the machine is discussed. Software (program code) for a fixed-instruction machine is a sequence of states. Because of the limited set of instructions available on a machine, the state sequence is restricted. Designing software for a programmable machine requires a somewhat different philosophy than that of designing hardware-programmed machines. In the hardware programmed machine, the design is made to reflect the sequential nature of the control problem as the designer views it. In the software programmed machine, the sequential nature of the problem is forced to fit state sequence capabilities of the machine. Dissert. Abstr.

NBO-10813*# National Aeronautics and Space Administration, Washington, D. C.
BEYSIK: LANGUAGE DESCRIPTION AND HANDBOOK FOR PROGRAMMERS (SYSTEM FOR THE COLLECTIVE USE OF THE INSTITUTE OF SPACE RESEARCH, ACADEMY OF SCIENCES USSR)
I. G. Orlov Oct. 1979 42 p Transl. into ENGLISH of BEYSIK.

Opisaniye Nazika i Rukovodstvo dlya Programmista (Sistema kollektivnogo polizovaniya IKI AN SSSR) (Moscow), pr-476, 1979 42 p Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Academy of Sciences (USSR), Moscow
(Contract NASw-3198)
(NASA-TM-75680; Pr-476) Avail: NTIS HC A03/MF A01 CSCL 09B

The BASIC algorithmic language is described, and a guide is presented for the programmer using the language interpreter. The high-level algorithm BASIC is a problem-oriented programming language intended for solution of computational and engineering problems. F.O.S.

N80-10814*# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
ISSUES IN THE DIGITAL IMPLEMENTATION OF CONTROL COMPENSATORS Ph.D. Thesis
Paul Moroney Oct. 1979 265 p refs
(Grant NGL-22-009-124)
(NASA-CR-162416; LIDS-TH-951) Avail: NTIS HC A12/MF A01 CSCL 09B

Techniques developed for the finite-precision implementation of digital filters were used, adapted, and extended for digital feedback compensators, with particular emphasis on steady state, linear-quadratic-Gaussian compensators. Topics covered include: (1) the linear-quadratic-Gaussian problem; (2) compensator structures; (3) architectural issues: serialism, parallelism, and pipelining; (4) finite wordlength effects: quantization noise, quantizing the coefficients, and limit cycles; and (5) the optimization of structures. A.R.H.

N80-10815# University of Southern California, Los Angeles.
DECISION MAKING, FUZZY SET THEORY AND COMPUTERS Final Report, 15 Aug. 1975 - 14 Aug. 1978
Richard Bellman and E. Stanley Lee Jul. 1979 29 p refs
(Grant DAAG29-76-G-0027)
(AD-A071842; ARO-12494.12-M) Avail: NTIS HC A03/MF A01 CSCL 09/2

A summary of the accomplishments of this project is given. A book has been published which contains chapters on can computers think, the digital computers, decision making, puzzles, uncertainty, simulation, learning, consciousness, humor, local logics, mathematical models of the mind, and communication and ambiguity. The summary also discusses fuzzy set theory in health delivery systems and in computers and linguistics. GRA

N80-10816# Georgia Inst. of Tech., Atlanta. School of Information and Computer Science.
HEURISTICS FOR DETERMINING EQUIVALENCE OF PROGRAM MUTATIONS
Douglas Baldwin (Yale Univ.) and Fredrick Sayward (Yale Univ.) New Haven, Conn. Yale Univ. Apr. 1979 32 p refs
(AD-A071795; ARO-15950.3-A-EL) Avail: NTIS HC A03/MF A01 CSCL 09/2

A mutant M of a program P is a program derived from P by making some well defined simple change in P. Some initial investigations on automatically detecting equivalent mutants of a program are presented. The idea is based on the observation that compiler optimization can be considered a process of altering a program to an equivalent but more efficient mutant of the program. Thus the inverse of compiler optimization techniques can be seen as, in essence, equivalent mutant detection. GRA

N80-10817# Army Tank-Automotive Systems Development Center, Warren, Mich.
TARADCOM SIGNAL ANALYSIS PROGRAM Final Report, Apr. - Sep. 1978
G. A. Fix Sep. 1978 109 p
(AD-A072014; TARADCOM-TR-12412) Avail: NTIS HC A06/MF A01 CSCL 09/2

The objective of this report is to provide a user manual for the Signal Analysis Computer Program. The TARADCOM Signal Analysis Program (formerly called the Fast Fourier Transform Program) was developed originally as a BASIC Wang Program by Robert Daigle and associates. The TSA computer program has been converted from BASIC to FORTRAN and various graphics displays, such as linear plot of evaluation vs. distance, a point plot of amplitude vs. periods, and a log-log graph of power spectral density vs. frequency, have been added. Terrain data input to the program may be used in processing, rather than data equations that are contained in the program. Options available during processing include: first to last point detrending, digital high pass filters, exponentially weighted running average, no detrending, interpolation, amplitude smoothing, and a GEO window. The results of the TSAP include, besides graphics displays, amplitudes, periods, frequencies, power spectral densities, and RMS values. GRA

N80-10818# Army Satellite Communications Agency, Fort Monmouth, N. J.
PROJECT ARIES: USERS MANUAL FOR ARIAN 2 AND ASSOCIATED SUBSYSTEMS Interim Report, 16 May - 24 Jul. 1979
Richard L. Conn 24 Jul. 1979 239 p
(DA Proj. 1L1-61101-A-91A)
(AD-A072471) Avail: NTIS HC A11/MF A01 CSCL 09/2

The objective of the research conducted under Project ARIES is to investigate and analyze an interactive assembly language software development technique which is similar in several basic concepts to techniques employed in Project Gandalf at CORADCOM. Tests comparing the development capability and speed of conventional assembly language programming techniques (cross assembly, resident assembly via a 'conventional' operating system, and cross compilation) and an early implementation of the proposed technique have shown that this new technique promises to provide a factor of from 3 to 10 decrease in program development time for assembly language programs written for the 8080 and Z80 microprocessors. GRA

N80-10819# California Univ., Santa Cruz. Information Sciences.
THE DESIGN AND VERIFICATION OF AN OPERATING SYSTEM KERNEL M.S. Thesis
Philip Gary Levy 19 Jun. 1979 130 p refs
(Contract N00014-76-C-0682)
(AD-A072552; TR-79-6-001) Avail: NTIS HC A07/MF A01 CSCL 09/2

Practical aspects of the design, implementation, and verification of operating systems are explored in this thesis. Axiomatic techniques for proving parallel programs (developed by Hoare, Owicki, and Gries) are extended and applied in the proof of an operating system kernel. The techniques developed apply directly only to environments with a single physical processor. A technique for mutual exclusion that is simple to implement and has properties that contribute to verification is presented. It is based on the disabling of context switching to allow a single process to execute without pre-emption. In such an excluded region, sequential verification techniques can be applied. GRA

N80-10820# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.
SET COVERING ALGORITHMS USING CUTTING PLANES, HEURISTICS, AND SUBGRADIENT OPTIMIZATION: A COMPUTATIONAL STUDY
Egon Balas and Andrew Ho Jul. 1979 43 p refs
(Contract N00014-75-C-0621; Grant NSF MCS-76-12026; NR Proj. 047-048)
(AD-A072458; MSRR-438; WP-8-79-80) Avail: NTIS HC A03/MF A01 CSCL 12/1

We report on the implementation and computational testing of several versions of a set covering algorithm, based on the family of cutting planes from conditional bounds. The algorithm uses a set of heuristics to find prime covers, another set of heuristics to find feasible solutions to the dual linear program which are needed to generate cuts, and subgradient optimization to find lower bounds. It also uses implicit enumeration with some new branching rules. Each of the ingredients was implemented and tested in several versions. The variant of the algorithm that emerged as best was run on 55 randomly generated test problems (20 of them from the literature), with up to 200 constraints and 2000 variables. The results show the algorithm to be more reliable and efficient than earlier procedures on large, sparse set covering programs. GRA

N80-10821# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.

CUTTING PLANES FROM CONDITIONAL BOUNDS: A NEW APPROACH TO SET COVERING

Egon Balas Jul. 1979 31 p refs

(Contract N00014-75-C-0621; Grant NSF MCS-76-12026; NR Proj. 047-048)

(AD-A072459; MSRR-437; WP-5-79-80) Avail: NTIS HC A03/MF A01 CSCL 12/1

A conditional lower bound on the minimand of an integer program is a number which would be a valid lower bound if the constraint set were amended by certain inequalities, also called conditional. If such a conditional lower bound exceeds some known upper bound, then every solution better than the one corresponding to the upper bound violates at least one of the conditional inequalities. This yields a valid disjunction, which can be used to partition the feasible set, or to derive a family of valid cutting planes. In the case of a set covering problem, these cutting planes are themselves of the set covering type. The family of valid inequalities derived from conditional bounds subsumes as a special case the Bellmore-Ratliff inequalities generated via involutory bases, but is richer than the latter class and contains considerably stronger members, where strength is measured by the number of positive coefficients. GRA

N80-10822# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.

AN IMPROVED FORTRAN REORGANIZER Interim Report, Aug. 1977 - Feb. 1979

Kervyn D. Mach May 1979 96 p refs

(AD-A071334; AFAPL-TR-79-2052) Avail: NTIS HC A05/MF A01 CSCL 09/2

Because this office frequently distributes Fortran computer programs to other organizations, it needed a means to furnish these programs in a clean, easy to read format. This report describes a computer program designed to provide such a format by reorganizing Fortran routines. This reorganization includes: a sequential renumbering of the executable statment label with deletion of unused labels; a sequential renumbering and relocation of format statements; an alphanumeric reordering of dimensional and typed variables; and a uniform pattern of text spacing. The program has been extensively tested and has proved to be extremely valuable for reorganizing Fortran routines developed in-house and under contract and for preparing routines for distribution and publication. Author (GRA)

N80-10823# Rochester Univ., N. Y. Dept. of Computer Science.

PROGRESSIVE REFINEMENT OF RASTER IMAGES Technical Report

Kenneth R. Sloan, Jr. and Steven L. Tanimoto (Univ. of Washington) Nov. 1978 34 p

(Contract N00014-78-C-0164)

(AD-A072517; TR-39) Avail: NTIS HC A03/MF A01 CSCL 20/6

The transmission of high resolution raster images over low-bandwidth communication lines requires a great amount of time. User interaction in such a transmission environment can be frustrating. The problem can be eased somewhat by transmitting a series of low resolution approximations, which converge to the final image. Several methods of computing such a series of images are presented. Each is related to a particular type of pyramid data structure. They rely on the ability of the local display device to overpaint an existing image, and generally require some transmission and computation overhead. However, one of the methods requires no transmission overhead and only a small amount of local computation. A notation is introduced that permits concise descriptions of the image refinement processes. GRA

N80-10824# Systran Corp., Dayton, Ohio.

MATE SUPPORT SOFTWARE ANALYSIS Final Technical Report, Feb. - Aug. 1978

W. Lynn Trainor Aug. 1978 89 p refs

(Contract F33615-77-D-1042)

(AD-A070931; AFAL-TR-78-166) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report describes a research study, the objective of which was to analyze and document those elements of support software used on the Digital Avionics Information System (DAIS) Program which could satisfy the support software requirements of the Modular Automatic Test Equipment (MATE) Project. Since many of the objectives of the MATE Program are closely aligned with those of DAIS, it was felt that some of the software items and standards developed for DAIS could be applicable to the MATE Program. The first sections of this report present an overview of the three areas of MATE software: MATE software of current-day systems, additional MATE software requirements beyond those satisfied with current-day MATE software, and MATE-unique software requirements. Using these as a basis for comparison the DAIS software was analyzed for applicability to the MATE system. The results of this analysis are presented in the final sections. GRA

N80-10825# General Electric Co., Arlington, Va.

IDENTIFICATION AND VALIDATION OF QUANTITATIVE MEASURES OF THE PSYCHOLOGICAL COMPLEXITY OF SOFTWARE Final Report, 1 Mar. 1977 - 28 Feb. 1979

Bill Curtis and Sylvia B. Sheppard 27 Apr. 1979 71 p refs

(Contract N00014-77-C-0158)

(AD-A072547; TR-79-388100-7) Avail: NTIS HC A04/MF A01 CSCL 09/2

This final report describes a program of research conducted to identify factors affecting the psychological complexity of software. The work conducted pursuant to this task consisted of three within subjects, multifactor experiments. The methodology employed in these experiments is described in detail. Separate sections discuss the results obtained for software complexity metrics and for modern coding practices. The major results of this research program are experimental verifications of increased programmer efficiency when working with structured code and the ability to predict programmer performance with Halstead's effort metric (a quantitative measure of software complexity). GRA

N80-10826# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.

VAL: A VALUE-ORIENTED ALGORITHMIC LANGUAGE (PRELIMINARY REFERENCE MANUAL)

William B. Ackerman and Jack B. Dennis 13 Jun. 1979 84 p

(Contract N00014-75-C-0661; Grant NSF DCR-75-04060)

(AD-A072394) Avail: NTIS HC A05/MF A01 CSCL 09/2

The programming language VAL (Value-Oriented Algorithmic Language) is designed for expressing algorithms for execution on computers capable of highly concurrent operation. More specifically, the application area to be supported is numerical computation which strains the limits of high performance machines, and the primary targets for translation of VAL programs are data driven machines of the form under development by the Computation Structures Group of the MIT Laboratory for Computer Science for High performance numerical computers. GRA

N80-10827# California Univ., Livermore. Lawrence Livermore Lab.

ALGORITHM FOR ENHANCING LOW-CONTRAST DETAILS IN DIGITAL IMAGES

G. K. Myers and R. E. Twogood 10 Nov. 1978 6 p refs

(Contract W-7405-eng-48)

(UCID-18015) Avail: NTIS HC A02/MF A01

An algorithm for improving the contrast in digital images, called contrast stretching was implemented on the CDC 7600 computer. The applicability of this algorithm to radiographic image enhancement was investigated. Excellent contrast improvements were observed for several example images. DOE

N80-10828# Argonne National Lab., Ill. Applied Mathematics Div.

TEST PROBLEMS FOR CONSTRAINED NONLINEAR MATHEMATICAL PROGRAMMING ALGORITHMS

Larry W. Cornwell (Western Illinois Univ., Macomb), P. A. Hutchinson (Western Illinois Univ., Macomb), Michael Minkoff, and Hilbert K. Schultz (Wisconsin Univ., Oshkosh) Oct. 1978 77 p refs Revised

(Contract W-31-109-eng-38)

(ANL-AMD-TM-320-Rev-1) Avail: NTIS HC A05/MF A01
A collection of constrained nonlinear programming problems are presented for use in testing optimization algorithms. The problems vary in size from two variables to one hundred variables with various combinations of linear/nonlinear constraints and objective functions. IBM FORTRAN IV programs were written to provide function values and gradients for the objective function and constraints. Each coded problem was checked at several points against published results, and a validation process was used to check the values of the objective function, constraints, and gradients. The problems were collected from various sources, and many of them have been used by other authors in published results of their algorithm testing. This report should also be useful in an educational setting to provide students with experience in nontrivial problems. Listings of the IBM FORTRAN code are included in this report. DOE

N80-10829# Argonne National Lab., Ill.
USER'S GUIDE TO PLOTIN/MYPLOT. A GENERAL-PURPOSE PLOTTING ROUTINE FOR USE WITH AMD GRAPHICS
R. E. Toohey, J. Rundo, and T. J. Kotek Sep. 1978 102 p
(Contract W-31-109-eng-38)
(ANL/RER/TM-3) Avail: NTIS HC A06/MF A01
Topics covered in the user's guide include use of PLOTIN; additional features afforded by subprograms; job control language; examples; and calling MYPLOT. DOE

N80-10830# Los Alamos Scientific Lab., N. Mex.
INTRODUCTION TO VECTRAN AND ITS USE IN SCIENTIFIC APPLICATIONS PROGRAMMING
B. L. Buzbee, comp. and J. F. Morrison, comp. 20 Sep. 1978 261 p refs Presented at the LASL Workshop on Vector and Parallel Processors, Los Alamos, New Mexico, 20-22 Sep. 1978
(Contract W-7405-eng-26)
(LA-7491-C; Conf-780945) Avail: NTIS HC A12/MF A01
Abstracts of the papers presented at the workshop are given. Topics discussed include: diagnostic system of the ICL 2900 series, vectorization of large scale codes, the CRAY-1 simulator, and Poisson solvers. F.O.S.

N80-10254*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A REED-SOLOMON DECODING PROGRAM FOR CORRECTING BOTH ERRORS AND ERASURES
R. L. Miller, T. K. Truong, B. Benjauthrit, and I. S. Reed *In its* The Deep Space Network 15 Oct. 1979 p 102-107 refs
(For primary document see N80-10240 01-12)
(Grant AF-AFOSR-1798-75)
Avail: NTIS HC A09/MF A01 CSCL 09B

N80-10256*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DSN CONSCAN: A VECTOR NOMENCLATURE AND METHOD FOR DETERMINING PARAMETER VALUES
T. H. Taylor and J. LaValle *In its* The Deep Space Network 15 Oct. 1979 p 113-122 ref (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 09B

62 COMPUTER SYSTEMS

Includes computer networks.

N80-10831# California Univ., Berkeley. Lawrence Berkeley Lab.
PROCEEDINGS OF THE THIRD BERKELEY WORKSHOP ON DISTRIBUTED DATA MANAGEMENT AND COMPUTER NETWORKS
Aug. 1978 377 p refs Conf. presented at San Francisco, 29 Aug. 1978
(Contract W-7405-eng-48)
(LBL-7953; Conf-780828) Avail: NTIS HC A17/MF A01
The following topics are discussed: (1) Provisional model of open system architecture; (2) Software architecture for a microprocessor-based packet network; (3) Protocol converters and user interface in the CYCLADES network; (4) Architecture for secure packet-switched networks; (5) Inter-network fragmentation and the TCP; (6) Dynamic management of packet radio slots; (7) Failsafe distributed algorithms for routing in communication networks; (8) Design of elementary distributed systems; (9) Synchronization in distributed system modules; (10) Performance limits of the TMM protocol; modeling and measurement; and (11) Distributed simulation using a network of microcomputers. M.M.M.

N80-10832# Department of Justice, Washington, D.C.
COMPUTER SYSTEMS CONVERSION: A MANAGEMENT PERSPECTIVE Final Report
Daniel B. Schneider Oct. 1978 86 p refs
(PB-297604/1) Avail: NTIS HC A05/MF A01 CSCL 09B
Computer systems conversion, and its interplay with the procurement of computer equipment is considered. Large-scale computer systems such as are found in the U.S. Department of Justice are emphasized. Data base management systems, and on-line transaction processing are included. The Federal procurement situation is also discussed. GRA

63 CYBERNETICS

Includes feedback and control theory.
For related information see also 54 Man/System Technology and Life Support.

N80-10833 State Univ. of New York at Stony Brook.
CONTINUOUS SIMULATION OF QUEUEING NETWORKS *WITH TRANSIENT AND TIME VARYING CONDITIONS*
Ph.D. Thesis
Kuo-Kai George Wang 1979 109 p
Avail: Univ. Microfilms Order No. 7922975
This research deals with the simulation of transient solutions of average queue length L(t) and variance D(t) with time varying input process. Instead of using arrival process control, service process control which includes varying in number of servers, service rates and the dispatch routing will be used to control states of the queueing network. These states of the queueing network are represented by a set of variables L sub i (t) and D sub i (t) for each service station i in the network. Robust and simple differential equations of states with an approximate equation of utilization U sub i(t) were sought and simulated for a M/M/1 queueing network. Results checked very closely with those of direct simulation of probability distributions by Fan and were obtained with a substantial savings in storing memories and computing time. The system which was represented by these state equations and an approximation equation was proved to be stable during the numerical integration process.
Dissert. Abstr.

N80-10834# Naval Underwater Systems Center, New London, Conn. New London Lab.
OPTIMIZATION OF COMPUTER OPERATING SYSTEMS
Ph.D. Thesis
Charles Raymond Arnold 15 Apr. 1979 286 p refs
(AD-A071463; NUSC-TR-6045) Avail: NTIS HC A13/MF A01 CSCL 09/2
The first portion of this thesis is devoted to an adequate formulation within modern control-theoretic concepts of the resource management function of computer operating systems. Then a major portion of the remainder of the thesis is devoted to exploiting estimating and control techniques for the management of the single most important resource, namely, memory.
GRA

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N80-10835*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

LYAPUNOV STABILITY AND ITS APPLICATION TO SYSTEMS OF ORDINARY DIFFERENTIAL EQUATIONS
Eusi W. Kennedy Sep. 1979 32 p refs
(NASA-TM-80806; Rept-79-FM-31; JSC-16079) Avail: NTIS HC A03/MF A01 CSCL 12A

An outline and a brief introduction to some of the concepts and implications of Lyapunov stability theory are presented. Various aspects of the theory are illustrated by the inclusion of eight examples, including the Cartesian coordinate equations of the two-body problem, linear and nonlinear (Van der Pol's equation) oscillatory systems, and the linearized Kustaanheimo-Stiefel element equations for the unperturbed two-body problem. A.R.H.

N80-10838*# Houston Univ., Tex. Dept. of Mathematics.
ON THE CONSISTENCY OF THE MAXIMUM LIKELYHOOD ESTIMATE OF NORMAL MIXTURE PARAMETERS FOR A SAMPLE WITH FIELD STRUCTURE
Charles Peters Aug. 1979 18 p refs
(Contract NAS9-15543)
(NASA-CR-160352; Rept-74) Avail: NTIS HC A02/MF A01 CSCL 12A

General theorems concerning the strong consistency of the MLE of exponential mixture parameters are proved. These theorems imply the strong consistency of the MLE of normal mixture parameters when the data is organized into fields each of which is a random sample from one of the component normal distributions. Author

N80-10837# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Science Research Group.
A RESTRICTED LAGRANGEAN APPROACH TO THE TRAVELING SALESMAN PROBLEM
Egon Balas and Nicos Christofides (Imperial College of Science and Technology, London) Jul. 1979 50 p refs
(Contract N00014-75-C-0621; Grant NSF MSC-76-12026)
(AD-A072457; MSRR-439; WP-7-79-80) Avail: NTIS HC A03/MF A01 CSCL 12/1

We describe an algorithm for the asymmetric traveling salesman problem (TSP) using a new, restricted Lagrangean relaxation based on the assignment problem (AP). The Lagrange multipliers are constrainted so as to guarantee the continued optimality of the initial AP solution, thus eliminating the need for repeatedly solving AP in the process of computing multipliers. We give several polynomially bounded procedures for generating valid inequalities and taking them into the Lagrangean function with a positive multiplier without violating the constraints, so as to strengthen the current lower bound. Upper bounds are generated by a fast heuristic whenever possible. When the bound-strengthening techniques are exhausted without matching the upper with the lower bound, we branch by using two different rules, according to the situation: the usual subtour breaking disjunction, and a new disjunction based on conditional bounds. We discuss computational experience on 120 randomly generated asymmetric TSP's with up to 325 cities, the maximum time used for any single problem being 82 seconds. Though the algorithm discussed here is for the asymmetric TSP, the approach can be extended to the symmetric TSP by using the 2-matching problem instead of AP. GRA

N80-10838# Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.
GENERATING COVARIANCE SEQUENCES AND THE CALCULATION OF QUANTIZATION AND ROUNDING ERROR VARIANCES IN DIGITAL FILTERS
J. P. Dugre, A. A. Beex, and L. L. Sharf Jun. 1979 13 p refs
(Contract N00014-75-C-0518)
(AD-A072077; CSU-TR-28) Avail: NTIS HC A02/MF A01 CSCL 12/1

A linear algorithm is given for the generation of covariance sequences for rational digital filters using numerator and denominator coefficients directly. There is no need to solve a Lyapunov equation or to solve for the residues of a spectrum, as in other methods. By appealing to certain results from the theory of inners we show the algorithm provides a unique solution provided only that the filter is stable. Our results may be used to compute error variances due to product rounding and signal quantization, and to generate covariance strings (r sub k) from 0 to K used in other studies involving second-order properties of digital filters. GRA

N80-10839# North Carolina Univ. at Chapel Hill. Inst. of Statistics.
ON ESTIMATING VARIANCE OF ROBUST ESTIMATORS WHEN THE ERRORS ARE ASYMMETRIC *Interim Report*
Raymond J. Carroll Aug. 1978 22 p refs
(Grant AF-AFOSR-75-2796; AF Proj. 2304)
(AD-A072598; MIMEO-SER-1177; AFOSR-78-1438TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

We investigate the effects of asymmetry on estimates of variance of robust estimator in location and regression problems, showing the heavy skewness of errors can seriously bias the common variance estimates for location and intercept, a problem that can be corrected by jackknifing for location but is more intractable for the intercept in regression. The scale parameters in regression seem not to be as seriously subject to this bias if the sample size is large compared to the number parameters. GRA

N80-10840# Maryland Univ., College Park. Inst. for Physical Science and Technology.
ON THE NUMERICAL SOLUTION OF HELMHOLTZ EQUATION BY THE FINITE ELEMENT METHOD
A. K. Aziz and A. Werschulz Jan. 1979 51 p refs
(Contract E(40-1)-3443)
(DOE/ER-03443-79; TN-BN-894) Avail: NTIS HC A03/MF A01

An optimal error bound in a general context is obtained which contains as a special case an optimal error estimate. The solution of the boundary value problem was reduced by a two-stage finite element procedure to the solution of a 2 x 2 first order elliptic system of the Petrovski type for which suitable shift theorems are known. A numerical example is given for a certain case. The computed error estimates agree with the theoretical estimates given. DOE

N80-10841# Los Alamos Scientific Lab., N. Mex.
METHOD OF LINES APPROACH TO THE NUMERICAL SOLUTION OF CONSERVATION LAWS
J. M. Hyman 1979 14 p refs Presented at the 3d IMACS Intern. Symp. on Computer Methods for Partial Differential Equations, Bethlehem, Pa., 20-22 Jun. 1979
(Contract W-7405-eng-36)
(LA-UR-79-837; Conf-790619) Avail: NTIS HC A02/MF A01

Explicit finite difference methods are developed for approximating the discontinuous time dependent solutions of nonlinear hyperbolic conservation laws. The analysis is based on the method of lines approach of decoupling the space and time discretizations and analyzing each independently before combining them into a composite method. Particular attention is given to analyzing high order spatial differences, artificial dissipation, and the accurate approximation of boundary conditions. Both a third order iterated leap frog predictor-corrector and a second order iterated Runge-Kutta method are shown to have excellent stability and accuracy properties for the time integration. These methods are A-stable when iterated to convergence and have the special property of allowing for local improvements in the stability and accuracy of the computed solution. DOE

N80-10842# Maryland Univ., College Park. Dept. of Physics and Astronomy.
TIME-DEPENDENT HARTREE-FOCK PHASE: UNIQUE IMPLICATION OF VARIATIONAL PRINCIPLE
P. C. Lichtner, J. J. Griffin, R. Schultheis, and A. B. Volkov Mar. 1979 11 p refs
(Contract EY-76-S-05-5126)
(ORO-5126-50; UMD-TR-79-018; UMD-PP-79-032) Avail: NTIS HC A02/MF A01

The time dependent Hartree-Fock (TDHF) variational principle is shown to yield a unique solution with no indeterminacy in its time-dependent phase. The long-standing contrary opinion arises from an impermissible restriction to norm-preserving variations. DOE

N80-10843# Union Carbide Corp., Oak Ridge, Tenn. Mathematics and Statistics Research Dept.
MODELING FOR MOVING BOUNDARY PROBLEMS
A. D. Solomon 1979 20 p refs Presented at Solar Energy Storage Workshop, Chandigarh, India, 9 Mar. 1979
(Contract W-7405-eng-26)
(CONF-790345) Avail: NTIS HC A02/MF A01

The current state of the art of moving boundary problems as it applies to the storage of heat as latent heat is described. DOE

N80-10844# Stanford Univ., Calif. Dept. of Statistics.
MIXING CONDITIONS AND LIMIT THEOREMS FOR MAXIMA OF SOME STATIONARY SEQUENCES
Michael R. Chernick Aug. 1978 97 p refs Sponsored in part by EPA and NSF
(Contract EY-76-S-02-2874)
(COO-2874-38; TR-18) Avail: NTIS HC A05/MF A01

The results presented, along with results for associative processes provide the basic tools used to prove the limit theorems studied. A class of first-order exponential autoregressive processes is also studied. The processes are shown to satisfy the condition of Loynes' theorem. The strong mixing condition which in general would be difficult to check is found to be much easier to verify in this special case due to the Markov structure of the process. A general condition is given which implies strong mixing for Markov and p/sup th/ order autoregressive processes. This condition is easy to check for Markov processes. It was concluded that even when stationary and mixing conditions are assumed, the limit can differ from the independent case. It was shown that for some first-order autoregressive processes the limit distribution can depend on the autocorrelation at lag 1 whereas for processes satisfying Leadbetter's or Loynes' conditions the limit does not depend on the lag 1 autocorrelation. DOE

N80-10845# Denver Univ., Colo. Dept. of Mathematics.
CONSTRUCTION OF WELL-CONDITIONED SYSTEMS FOR FREDHOLM I PROBLEMS BY MESH ADAPTING
F. Hagin 1979 31 p refs
(Contract EY-76-C-02-2482)
(COO-2482-10) Avail: NTIS HC A03/MF A01

The numerical solution of linear Fredholm I integral equations of the type arising from various one-dimensional inverse scattering problems is addressed. Typically, when these equations are discretized, they lead to very ill-conditioned algebraic systems. It is shown that for these types of kernels a relatively simple mesh adapting scheme leads to very well-conditioned systems. Moreover, when the kernel is not known explicitly but must be generated by numerically solving a boundary-value problem, an asymptotic analysis can extract the information to adapt this mesh successfully. DOE

N80-10846# California Univ., Livermore. Lawrence Livermore Lab.
PROCEEDINGS OF AESOP-SCIE SYMPOSIUM ON ADVANCED COMPUTING
1978 111 p refs Symp. held at Las Vegas, Nev., 19 Oct. 1979
(Contract W-7405-eng-48)
(CONF-781061-P2) Avail: NTIS HC A06/MF A01

Large and small machines of advanced designs that are currently in the conception, design or initial production stage are presented. Individual items were prepared separately for the data base. The BSP which uses a large-scale Burroughs B 7700/B 7800 general-purpose computer as a system manager is described. The BSP parallel processor has 16 parallel arithmetic elements driven in lock-step by a single instruction stream. Hence, the BSP is a single-instruction, multiple-data stream architecture. In this respect, it is comparable with other large pipeline or parallel scientific processors. DOE

N80-10051 Allerton Press, Inc., New York, N. Y.
ON MINIMIZING INTEGRAL QUADRATIC ESTIMATES
L. G. Romanenko *In its* Soviet Aeron., v. 21, no. 4, 1978 p 98-102 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats. Tekh., (USSR), v. 21, no. 4, 1978 p 124-129
(For primary document see N80-10031 01-01)
Copyright. Avail: Allerton Press, Inc., 150 Fifth Avenue, New York, N.Y. 10011: $45.00

N80-10281*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
AN IMPROVEMENT IN FOURIER TRANSFORM ACCURACY
R. C. Bunce *In its* The Deep Space Network 15 Oct. 1979 p 155-160 (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N80-10847# Florida State Univ., Tallahassee. Dept. of Statistics.
LIMIT DISTRIBUTIONS OF KOLMOGOROV-SMIRNOV TYPE STATISTICS UNDER A FIXED ALTERNATIVE WITH ESTIMATED LOCATION AND SCALE PARAMETERS
Constance L. Wood (Kentucky Univ.) and R. J. Serfling Jul. 1979 18 p refs
(Contract N00014-76-C-0608)
(AD-A072159; FSU-STATISTICS-M509; ONR-TR-142) Avail: NTIS HC A02/MF A01 CSCL 12/1

Much attention has been devoted to Monte Carlo simulations of the power of Kolmogorov-Smirnov type goodness-of-fit statistics when nuisance parameters of the hypothesized distribution are estimated. Here we consider the asymptotic behavior of such statistics at fixed alternatives when location and scale parameters are estimated. It is shown that suitably normalized Kolmogorov-Smirnov statistics converge in distribution to Gaussian-related random variables depending on the alternative distribution and the maximum deviation between the null and alternative distribution functions. The work of Raghavachari is thus extended from simple hypotheses to the case of composite hypotheses with estimated nuisance parameters. GRA

N80-10848# Florida State Univ., Tallahassee. Dept. of Statistics
ON RATES OF CONVERGENCE IN THE L2 NORM OF NONPARAMETRIC PROBABILITY DENSITY ESTIMATES
K. F. Cheng and R. J. Serfling Jul. 1979 15 p refs
(Contract N00014-76-C-0608)
(AD-A072134; FSU-STATISTICS-M506; ONR-TR-139) Avail: NTIS HC A02/MF A01 CSCL 12/1

For estimation of a probability density function f by an empirical probability density function f sub n based on a sample of size n from f, a useful measure of distance is the L2-norm. Considerable study of the rate of mean square convergence of abs. val. (f sub n-f) to 0 has taken place. This paper investigates the rate of almost sure convergence of abs. val. (f sub n-f) to 0. Application to certain estimation problems in nonparametric inference is discussed. GRA

N80-10849# Florida State Univ., Tallahassee. Dept. of Statistics.
CONVERGENCE RATE FOR THE MEAN INTEGRATED SQUARED ERRORS OF SOME NONPARAMETRIC DENSITY ESTIMATORS OF RECURSIVE DELTA-FUNCTION TYPE
E. P. Cheng and R. J. Serfling Jul. 1979 15 p refs
(Contract N00014-76-C-0608)
(AD-A072133; FSU-STATISTICS-M505; TR-138-ONR) Avail: NTIS HC A02/MF A01 CSCL 12/1

For estimation of a probability density function f by an empirical function f sub n based on a sample of size n from f, a widely used measure of goodness is the mean integrated squared error. For the well known delta-function type of f sub n, we show that the asymptotic behavior of this measure is essentially unchanged if f sub n is replaced by a recursive version. Also, we characterize this asymptotic behavior under somewhat milder smoothness restrictions on f than previously considered in the literature, at the expense however of adding tail restrictions GRA

N80-10850# Florida State Univ., Tallahassee. Dept. of Statistics.
A VARIATION ON SCHEFFE'S THEOREM WITH APPLICATION TO NONPARAMETRIC DENSITY ESTIMATION
R. J. Serfling May 1979 11 p refs
(Contract N00014-76-C-0608)
(AD-A072132; FSU-STATISTICS-M502; TR-137-ONR) Avail: NTIS HC A02/MF A01 CSCL 12/1

For probability density functions (f sub n) and f defined on a d-dimensional Euclidean space, Scheffe proved the useful result that pointwise convergence of f sub n to f implies convergence in the mean as well. In some applications it is of interest to know the rate of the mean convergence, and, in particular, to connect it with the rate of the uniform pointwise convergence. A basic lemma of this type is derived and applied to some problems in nonparametric density estimation. GRA

N80-10851# Los Alamos Scientific Lab., N. Mex.
BIVARIATE DISTRIBUTIONS WITH GIVEN MARGINALS AND FIXED MEASURES OF DEPENDENCE
Mark E. Johnson and Aaron Tenenbein (New York Univ., N. Y.) Mar. 1979 25 p refs
(Contract W-7405-eng-36)
(LA-7700-MS) Avail: NTIS HC A02/MF A01

Two systematic approaches are given for constructing continuous bivariate distributions with specified marginals and fixed dependence measures. Both approaches are based on linear combinations of independent random variables and result in bivariate distributions, which can attain the Frechet bounds. The dependence measures considered are the grade correlation coefficient and Kendall's tau. The joint distributions obtained are compared to those of earlier authors. Applications to testing for sensitivity in simulation models are discussed. DOE

N80-10040# Allerton Press, Inc., New York, N. Y.
FIELD STATE ESTIMATION BY LEAST SQUARES
G. L. Degtyarev *In its* Soviet Aeron., v. 21, no. 4, 1978 p 43-47 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Aviats Tekh., (USSR), v. 21, no. 4, 1978 p 43-47 (For primary document see N80-10031 01-01)
Avail: Allerton Press, Inc., 150 Fifth Avenue, New York, N. Y. 10011: $45.00

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N80-10852*# ECON, Inc., Princeton, N. J.
THE REQUIREMENTS AND FEASIBILITY OF BUSINESS PLANNING IN THE OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
Joel S. Greenberg and B. P. Miller 22 Mar. 1979 265 p refs
(Contract NASw-3047)
(NASA-CR-162388; Rept-79-278-2) Avail: NTIS HC A12/MF A01 CSCL 12B

The feasibility of applying strategic business planning techniques which are developed and used in the private sector to the planning of certain projects within the NASA Office of Space and Terrestrial Applications was assessed. The methods of strategic business planning that are currently in use in the private sector are examined. The typical contents of a private sector strategic business plan and the techniques commonly used to develop the contents of the plan are described, along with modifications needed to apply these concepts to public sector projects. The current long-range planning process in the Office of Space and Terrestrial Applications is reviewed and program initiatives that might be candidates for the use of strategic business planning techniques are identified. In order to more fully illustrate the information requirements of a strategic business plan for a NASA program, a sample business plan is prepared for a hypothetical Operational Earth Resources Satellite program. A.R.H.

N80-10853# Radio Corp. of America, Palo Alto, Calif.
METHOD OF TIME SERIES MODELLING, PARAMETER AND STATE ESTIMATION OF NONLINEAR SYSTEMS
Harold Schneider 23 Jul. 1979 71 p refs Backup document for AIAA Synoptic scheduled for publication in the Journal of Guidance and Control, Mar. - Apr. 1980
Avail: NTIS HC A04/MF A01

Analytical spline algorithms are presented for obtaining weighted least squares estimates for states of a nonlinear system of nth order differential equations whose functional state dependence is largely unknown and whose measured states are corrupted by zero mean uncorrelated noise. The algorithms are general and flexible. The spline series accurately represents complex state functional dependence in the time domain using relatively few terms. K.L.

N80-10854*# National Aeronautics and Space Administration, Langley Research Center, Hampton, Va.
APPLICATION OF QUEUEING MODELS TO MULTIPROGRAMMED COMPUTER SYSTEMS OPERATING IN A TIME-CRITICAL ENVIRONMENT
Dave E. Eckhardt, Jr. Washington Oct. 1979 22 p refs
(NASA-TM-80143; L-13209) Avail: NTIS HC A02/MF A01 CSCL 09B

A model of a central processor (CPU) which services background applications in the presence of time critical activity is presented. The CPU is viewed as an M/M/1 queueing system subject to periodic interrupts by deterministic, time critical process. The Laplace transform of the distribution of service times for the background applications is developed. The use of state of the art queueing models for studying the background processing capability of time critical computer systems is discussed and the results of a model validation study which support this application of queueing models are presented. Author

N80-10998# Joint Publications Research Service, Arlington, Va.
PRINCIPLES OF ERGONOMIC STANDARDS DISCUSSED
V. Munipov *In its* USSR Report: Biomedical and Behavioral Sci., No. 112 23 Jul. 1979 p 47-54 refs Transl. into ENGLISH from Obshchestvennye Nauki (Moscow), no. 3, 1979 p 175-181 (For primary document see N80-10993 01-99)
Copyright. Avail: NTIS HC A06/MF A01

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N80-10855# Stanford Univ., Calif. Dept. of Computer Science.
MATRIX INVERSE EIGENVALUE PROBLEM FOR PERIODIC JACOBI MATRICES
D. L. Boley and G. H. Golub Dec. 1978 17 p Presented at the 4th Conf. on Basic Probl. of Numerical Analysis, Pilsen, Czechoslovakia, Sep. 1978
(Contract EY-76-S-03-0326-030)
(STAN-CS-78-684) Avail: NTIS HC A02/MF A01

A stable numerical algorithm is presented for generating a periodic Jacobi matrix from two sets of eigenvalues and the product of the off-diagonal elements of the matrix. The algorithm requires a simple generalization of the Lanczos algorithm. It is shown that the matrix is not unique, but the algorithm will generate all possible solutions. DOE

N80-10856# Florida State Univ., Tallahassee. Dept. of Physics.
GENERAL RELATIVISTIC GRAVITATION AS THE THEORY OF BROKEN SYMMETRY OF INTRANSITIVE GROUPS OF TRANSFORMATIONS
L. Halpern Jul. 1978 9 p refs Presented at the Integrative Conf. on Group Theory and Math. Phys., Austin, Tex., 11-16 Sep. 1978
(Contract EY-76-C-03-0515)
(SLAC-Pub-2167; Conf-780970-4) Avail: NTIS HC A02/MF A01

General relativistic gravitational theories are constructed from

suitable intransitive continuous groups of transformations. A minimal invariant variety forms the unperturbed universe. The formalism of the group is generalized to have the symmetry of its action on this manifold broken by gauge potentials. The theory is expressed in these potentials, and it is shown how the present symmetry breaking is related to a general metric. The physical interpretation of the formalism is outlined. DOE

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N80-10857# California Univ., Livermore. Lawrence Livermore Lab.

HIGH TEMPERATURE SCIENCE: FUTURE NEEDS AND ANTICIPATED DEVELOPMENT IN HIGH-DENSITY SHOCK-WAVE RESEARCH

M. Ross, T. J. Ahrens, and W. J. Nellis 7 Mar. 1979 22 p
(Contract W-7405-eng-48)
(UCID-18072) Avail: NTIS HC A02/MF A01

Shock-wave experiments on condensed matter currently achieve pressures up to 5 Mbar, and temperatures over 20,000 K. Ultra high shock wave methods examined include the use of high powered lasers, electric guns, rail guns, and nuclear explosions. Space shuttle based compression studies and isentropic compression are discussed, as well as, the use of current driver technology in initiatives related to spectroscopy, optical properties, expanded metals research, and flash X-ray diffraction. A.R.H.

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see 45 Environment Pollution.

N80-10858 Rochester Univ., N. Y.

THEORY OF PHONON ECHOES IN INSULATORS Ph.D. Thesis

Charles Frank Gaumond 1979 95 p
Avail: Univ. Microfilms Order No. 7922932

The equation of motion for acoustic waves, including the nonlinear effects of a strain dependent dielectric constant in an insulator is examined. The time behavior of these acoustic waves when the material is immersed in a homogeneous time varying electric field is discussed. This behavior is shown to produce time reversed echoes when the electric field is pulsed.
Dissert. Abstr.

N80-10859*# Utah Univ., Salt Lake City.

THE EFFECT OF THE DURATION OF JET AIRCRAFT FLYOVER SOUNDS ON JUDGED ANNOYANCE

Kevin P. Shepherd Sep. 1979 71 p refs
(Grant NsG-1272)
(NASA-CR-159132) Avail: NTIS HC A04/MF A01 CSCL 20A

The effect of the duration of jet aircraft flyover sounds on humans and the annoyance factor are examined. A nine point numerical category scaling technique is utilized for the study. Changes in the spectral characteristics of aircraft sounds caused by atomospheric attenuation are discussed. The effect of Doppler shifts using aircraft noises with minimal pure tone content is reported. The spectral content of sounds independent of duration and Doppler shift are examined by analysis of variance. A.W.H.

N80-10860# Texas Univ. at Austin. Applied Research Lab.

HIGH INTENSITY SOUND RESEARCH, 1961-1978 Final Report, 1 Nov. 1975 - 31 Oct. 1978

David T. Blackstock Jun. 1979 77 p refs
(Contract F44620-76-C-0040; AF Proj. 2307)
(AD-A072550; ARL-TR-79-36; AFOSR-79-0906TR) Avail: NTIS HC A05/MF A01 CSCL 20/1

Although the present contract covers only a three-year period, research on high-intensity sound was continuously supported by AFOSR for 17 years, that is since 1961. For completeness, therefore, work done under four predecessor contracts is also reviewed. Throughout the 17 year period, the primary goal was to investigate nonlinear effects in the behavior of very intense sound. Despite its fundamental nature, the research was carried out with a view toward applications in national defense and technology, for example, the sonic boom, intense aircraft noise, and sonar. A complete chronological bibliography of all papers and reports pertaining to all five contracts is included. The previous contract numbers were: AF49(638)-1118, AF49(638)-1320, F44620-69-C-0044, and F44620-71-C-0015. GRA

N80-10861# Ohio State Univ. Research Foundation, Columbus.

SCATTERING OF ACOUSTIC WAVES BY ELASTIC AND VISCOELASTIC OBSTACLES OF ARBITRARY SHAPE IMMERSED IN A FLUID Technical Report, 1 Oct. 1978 - 31 May 1979

Bo A. Peterson, Vasundara V. Varadan, and Vijay K. Varadan Jun. 1979 44 p refs
(Contract N00014-78-C-0559)
(AD-A072274; OSURF-761251/711374) Avail: NTIS HC A03/MF A01 CSCL 20/1

A scattering or T-matrix approach is presented for studying the scattering of acoustic waves by elastic and viscoelastic obstacles immersed in a fluid. A Kelvin-Voigt model is used to obtain the complex elastic moduli of the viscoelastic solid. The T-matrix formulation is somewhat complicated because the wave equations and fields are quite different in the solid and fluid regions and are coupled by continuity conditions at the interface. We have obtained fairly extensive numerical results for prolate and oblate spheroids for a variety of scattering geometries. The backscattering, bistatic, absorption and extinction cross-section are presented as a function of the frequency of the incident wave. GRA

N80-10862# Naval Research Lab., Washington, D. C.

ACOUSTIC FLUCTUATION WORKSHOP: TECHNICAL REVIEW, EDITORIAL SUMMARY, SYNOPSIS AND PAPERS, VOLUME 1 Final Report

S. Hanish, C. R. Rollins, and J. Cybulski 12 Jul. 1978 197 p refs Workshop held in Washington, D. C., 22-23 Feb. 1978
(XF11121200)
(AD-A072309; NRL-MR-3884-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 20/1

A Workshop on Acoustic Fluctuations in the Ocean, sponsored by NAVELEX320 was held at the Naval Research Laboratory, Washington, D.C., on February 22-23, 1978. The theme was to highlight the relation between requirements of system performance models (APSURV, PSEUDO, APAIR, etc.) and current research on acoustic fluctuations conducted by Industry and the Navy, to find ways to establish closer cooperation between Researchers working in the fields, and Users of research results, and to recommend programs. This memorandum summarizes the agenda and key technical issues of the Workshop, and contains all papers presented. It also gives a brief history of previous Workshops on this subject, and a technical review of acoustic fluctuations in general. Recommendations for programs are scheduled to be made available in a separate publication. GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N80-10863 Rochester Univ., N. Y.

PROTON DEUTERON ELASTIC SCATTERING FROM 20 TO 220 GeV/c Ph.D. Thesis

Gary David Warren 1979 114 p
Avail: Univ. Microfilms Order No. 7922969

A deuteron gas jet was the target and the recoil deuterons were detected at large angles from the forward direction with a spectrometer employing a superconducting dipole and quadrupole doublet. A total of 5 x 10 to the 5th power recoil deuterons

were recorded for incident momenta from 20 to 220 GeV/c and with four-momentum transfer squared, in the range .6 < t < 3.0 sq (GeV/c). From these, approximately 150 differential cross sections were obtained. The results disagree with simple Glauber model predictions, and are typically significantly less than the predictions. The bulk of the data can be understood by adding corrections for the space-time development of the strong interaction to the Glauber model. Dissert. Abstr.

N80-10864 Vanderbilt Univ., Nashville, Tenn.
DIMUON PRODUCTION IN 15.5 GeV/c PION P INTERACTIONS Ph.D. Thesis
Ronald Edwin Cassell 1979 98 p
Avail: Univ. Microfilms Order No. 7922162

Prompt muon pair production in 15.5 GeV/c pi-rho interactions is described. The muon pairs are observed before they traverse an absorber yielding a mass resolution of the muon pair, and allowing a study of the charged hadrons accompanying muon pair production. A history of the field of prompt lepton production is presented, and the experimental apparatus is described. An account of the analysis procedure used to identify prompt muons is reported, along with the results of the analysis. Inclusive distributions of the muon pair, distributions of the charged hadrons accompanying the muon pair, and dimuon distributions from exclusive channels are discussed. Dissert. Abstr.

N80-10865 Colorado Univ. at Boulder.
SEMICLASSICAL QUANTIZATION OF NONSEPARABLE HAMILTONIAN SYSTEMS Ph.D. Thesis
Charles Jaffe 1979 152 p
Avail: Univ. Microfilms Order No. 7923251

The methods for the primitive and uniform semiclassical quantization of nonseparable Hamiltonian systems are developed. The transformation of integrable nonseparable Hamiltonians to angle action variables by a sequence of Van Vleck transformations is described. The calculation of the primitive semiclassical eigenvalues by evaluating the transformed Hamiltonian at the quantized values of the actions is discussed. The uniform semiclassical eigenvalues, found by numerical evaluation of the uniform semiclassical quantization condition are calculated. Dissert. Abstr.

N80-10866*# National Aeronautics and Space Administration, Washington, D. C.
ELEMENTS OF THE THEORY OF MOLECULAR SPECTRA
L. A. Gribov Oct. 1979 44 p refs Transl. into ENGLISH of "Elementy Teorii Molekulyarnykh Spectrov", Rept. PR-461 Acad. of Sci. USSR, Inst. of Space Res., Moscow, 1979 p 1-42 Original language document was announced as A78-15221 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-75686; PR-461) Avail: NTIS HC A03/MF A01 CSCL 20H

The basic aspects of the theory concerning the spectra of multiatomic molecules are presented. The classification of the forms of motions in a molecule, the methods for determining the corresponding Schroudinger levels, the spectral types and the selection rules are discussed in order to identify their presence and state in outer space. M.M.M.

N80-10867# Washington Univ., Seattle. Dept. of Chemistry.
TRANSIENTS IN VIBRATIONAL RELAXATION OF POLYATOMIC MOLECULES AT HIGH TEMPERATURES BY THE VARIABLE ENCOUNTER METHOD
M. C. Flowers, D. F. Kelley, F. C. Wolters, and B. S. Rabinovitch Jun. 1979 7 p refs Sponsored in part by NSF
(Contract N00014-75-C-0690; NR Proj. 092-549)
(AD-A070774; NR092-549-TR07) Avail: NTIS HC A02/MF A01 CSCL 07/4

Temperature dependence of vibrational energy transfer efficiency in high temperature gas systems is described. The Variable Encounter Method is applied to the study of the transient region in vibrational accommodation of cyclobutane at high temperature surfaces. Collision efficiency declines with rise of temperature. Surface collisions are more efficient than binary gas phase encounters. GRA

N80-10868# Louisiana State Univ. and A&M Coll., Baton Rouge. Dept. of Physics and Astronomy.
ELECTRON EXCITATION CROSS SECTIONS FOR MULTIPLY CHARGED IONS Progress Report, 1 Mar. 1978 - 28 Feb. 1979
R. J. W. Henry and J. Callaway 1978 8 p refs
(Contract EY-76-S-05-4881)
(ORO-4881-23) Avail: NTIS HC A02/MF A01

Collision strengths for electron impact excitation of helium-like ions were calculated for energies up to five times threshold energy for transitions 1S1-2S3, 2S1, 2P3(0), and 2P1(0). Results were obtained in a five state close coupling approximation for helium-like Li, C, O, and Si. Isoelectronic fits to the collision strength data were given. Cross sections for the electron impact excitation of the 2p/sub 1/2/ and 2p/sub 3/2/ states of the lithium-like ions C, Fe, Mo, and W were calculated in a relativistic Coulomb-Born approximation for energies up to ten times the 2p/sub 3/2/ threshold. An interpolation formula was presented which permits the estimation of these cross sections for similar ions of intermediate charges. The effect of an external electric field on the photodetachment of H(-) was calculated. DOE

N80-10869# California Univ., Berkeley. Lawrence Berkeley Lab.
IMPACT OF STORAGE RINGS ON ELEMENTARY PARTICLE PHYSICS
G. H. Trilling Mar. 1979 8 p Presented at the IEEE Particle Accelerator Conf., San Francisco, 12 Mar. 1979
(Contract W-7405-eng-48)
(LBL-8908; Conf-790327) Avail: NTIS HC A02/MF A01

Discoveries in elementary particle physics and the development of the art and science of making high-energy accelerators are related. It is almost twenty-five years since the construction of the Bevatron made possible the discovery of the antiproton; and, since that time, knowledge and understanding of particle physics has made enormous strides in step with developments in both the acclerator and the detector arts. How intimately many the recent advances are associated with success in the development of storage rings and colliding beams is assessed. DOE

N80-10870# Arizona Univ., Tucson.
DIFFRACTION DISSOCIATION OF HIGH ENERGY PROTON ON HELIUM
E. Jenkins, A. Bujak, A. Devensky, A. Kuznetsov, B. Morozov, V. A. Nikitin, P. Nomokonov, Y. Philipenko, A. Sandaez, V. Smirnov et al 1978 5 p refs Presented at 19th Conf. on High Energy Phys., Tokyo, 23 Aug. 1978 Prepared in cooperation with Joint Inst. for Nucl. Res., Dubna, (USSR) and Fermi Natl. Accelerator Lab., Batavia, Ill.
(Contract EY-76-C-02-3000)
(CONF-780826-10) Avail: NTIS HC A02/MF A01

Preliminary results are presented from a measurement of the inclusive process p + He(4) yields X + He(4) in the region .04 < or = /t/ < or = .5 sq(GeV/c) and sq Mx < or = 12 Ge sq V for five incident proton momenta from 46 to 400 GeV/c. In this region the differential cross section sq d epsilon/dt sq Mx shows at dependence of the type e /sup b/ 1 /sup t/ + de /sup b/ 2 /sup t/ and a dominant 1/sq Mx behavior for sq Mx > 5 Ge sq V. The measurement was performed at Fermilab by detecting slow recoil alpha particles from helium gas jet target placed at the internal beam of the accelerator. DOE

N80-10871# Arizona Univ., Tucson.
PROTON-HELIUM ELASTIC SCATTERING FROM 40 TO 400 GeV
E. Jenkins, A. Bujak, A. Kuznetsov, B. Morozov, V. A. Nikitin, P. Nomokonov, Y. Pilipenko, V. Smirnov, E. Malamud, M. Miyajima et al 1978 31 p refs Presented at 19th Conf. on High Energy Phys., Tokyo, 23 Aug. 1978 Prepared in cooperation with Joint Inst. for Nucl. Res., Dubna, (USSR) and Fermi Natl. Accelerator Lab., Batavia, Ill.
(Contract EY-76-C-02-3000)
(CONF-780826-9) Avail: NTIS HC A03/MF A01

The elastic proton-helium differential cross sections were determined for 5 different incident laboratory energies from 40 to 400 GeV in the range 0.003 < t absolute value

< 0.52 sq/GeV/c). The differential cross section drops 4 to 5 orders of magnitude to the first dip at t absolute value = 0.22. A Glauber analysis is performed on the data. The inelastic intermediate states are found to be important. The shrinkage of the slope of the differential cross section is measured. The rate of shrinkage is twice as large as in the p-p case. Results on the real part of the elastic scattering amplitude at forward angle and at the dip structure (t absolute value = to or approximately 0.22) are presented. DOE

N80-10872# Ohio Univ., Athens.
STUDY OF STRUCTURE OF LIGHT NUCLEI WITH NEUTRONS Progress Report, 1 Sep. 1977 - 30 Aug. 1978
Raymond O. Lane 1978 56 p refs
(Contract EY-76-S-02-2490)
(COO-2490-9) Avail: NTIS HC A03/MF A01

The series of measurements of neutron elastic differential cross sections for 4 MeV < or = E/sub n/ < or = 8 MeV is nearing completion. New elastic measurements for C-13 + n (1.57 MeV < or = E/sub n < 6.5 MeV) were completed, and these results are being studied with the R-matrix analysis program ORMAP. Elastic measurements for B-11 + n for 2 MeV < E/sub n/ < 4 MeV completed, and these results along with the earlier measurements from 4 MeV < or = E/sub n/ < 8 MeV are being used in a comprehensive analysis of B-11 + n from 0 to 8 MeV. This analysis should be completed by early fall. Inelastic measurements on these same light nuclei have begun, with differential cross sections for Li-7 + n (0.478 MeV level) completed at 2.3 and 2.8 MeV. DOE

N80-10873# Sandia Labs., Livermore, Calif.
PRODUCTION OF HYDROGEN, DEUTERIUM, AND HELIUM BY 15-MeV NEUTRONS
R. C. Haight, S. M. Grimes, K. R. Alvar, and H. H. Barschall 1978 7 p refs Prepared jointly with Wisconsin Univ., Madison
(Contract EY-76-S-02-2719)
(COO-2719-5; Conf-781105-49) Avail: NTIS HC A02/MF A01

Measurements were made of the hydrogen and helium production cross sections for both natural elements and separated isotopes which are constituents of metal under consideration for the first wall of fusion reactors. Results are applicable to the study of radiation damage to the first wall of a fusion reactor caused by hydrogen and helium produced in nuclear transmutations. The results of all measurements of reaction cross sections are summarized in tabular form. J.M.S.

N80-10874# Ames Lab., Iowa.
ANALYSIS AND COMPUTERIZED FITTING OF THE LINESHAPE OF THE NMR POWDER PATTERN
P. Dubois Murphy and Bernard C. Gerstein Oct. 1978 124 p refs
(Contract W-7405-eng-82)
(IS-4516) Avail: NTIS HC A04/MF A01

A derivation is presented of the theoretical lineshape of the NMR powder pattern. The effects of broadening and the finite value of the discontinuity are discussed. A graphical convolution technique is described. FORTRAN IV computer programs which will fit the lineshape (one or two tensors) to experimental data by the nonlinear least-squares method are presented. DOE

N80-10875# Los Alamos Scientific Lab., N. Mex. Theoretical Div.
MECHANISMS OF PROTON STABILITY AND DECAY IN UNIFIED MODELS
R. Slansky 1978 16 p refs Presented at Sem. on Proton Stability, Madison, Wisc., 8 Dec. 1978
(Contract W-7405-eng-36)
(LA-UR-79-361; Conf-781243-1) Avail: NTIS HC A02/MF A01

Proton stability is reviewed in the context of the Yang-Mills theories that unify electromagnetic, weak, and strong interactions with a simple Lie group G. The possibility of making the proton exactly stable or giving it a finite, but long lifetime, is discussed. Mechanisms for both possibilities are described. DOE

N80-10876# Oak Ridge National Lab., Tenn.
THEORY OF ELECTRON TRANSFER AND IONIZATION
Richard L. Becker 1979 5 p refs Presented at DOE/BES Res. Meeting on High Energy Atomic Phys., Manhattan, Kan., 5 Apr. 1979
(Contract W-7405-eng-26)
(Conf-790438-1) Avail: NTIS HC A02/MF A01

Charge transfer and ionization in high energy atomic collisions is discussed. Classical trajectory calculations, quantum mechanical collision theory, and phenomenological treatments of quantal interference effects in heavy ion collisions are examined. DOE

N80-10877# California Univ., Livermore. Lawrence Radiation Lab.
HIGH PEAK POWER PULSED WIP ELECTRON GUN Final Report, 1 Apr. - 1 Oct. 1978
G. Wakalopulos 1978 35 p
(Contract W-7405-eng-48)
(UCRL-13950) Avail: NTIS HC A03/MF A01

Experience in high power high pressure CO2 lasers resulted in the development of an electron gun capable of either pulsed or CW operation at current densities that can be varied by six orders of magnitude by a modulator at ground potential. This device, called the wire iron plasma (WIP) electron gun, was orginally developed for a CW airborne electrodynamic laser to improve the overall reliability, lifetime and ruggedness of E-beam pumped lasers. The following results were demonstrated: (1) pulse widths of less than 200 nsec are readily attainable at 150 kV and 1A/sq cm, (2) grid modulation is feasible but not necessary to obtain short pulses; and (3) high repetition rate (10 KHZ) operation is feasible, i.e., the plasma decays between pulses. DOE

N80-10878# Pittsburgh Univ., Pa. Dept. of Physics and Astronomy.
DEVELOPMENT AND TESTING OF A THREE-STAGE DOUBLE TANDEM ACCELERATOR-DECELERATOR SYSTEM FOR LOW ENERGY, HIGHLY STRIPPED IONS Progress Report, 1 Mar. 1978 - 28 Feb. 1979
James E. Bayfield Nov. 1978 36 p refs
(Contract EG-77-S-02-4257)
(COO-4257-3) Avail: NTIS HC A03/MF A01

Three-stage operation of the University of Pittsburgh accel decal double tandem source of highly stripped ion beams is described. The system produced O(+5), O(+6), O(+7), and O(+8) ions at specific energies as low as 15 keV per AMU. The design of the new decelerator tubes is discussed. The present performance and limitations of the overall system are outlined. Some new charge exchange cross sections were measured, for combined higher ion charge states and lower ion energies than heretofore was possible. Future four-stage operation with very heavy ions is considered. DOE

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see 93 Space Radiation.

N80-10879 Indiana Univ., Bloomington.
INTERMEDIATE ENERGY, INELASTIC, AND CHARGE EXCHANGE NUCLEON-NUCLEUS SCATTERING Ph.D. Thesis
Alan Picklesimer 1979 117 p
Avail: Univ. Microfilms Order No. 7921304

The cross section, asymmetry, and polarization data for elastic, inelastic, and charge exchange nucleon-nucleus scattering at intermediate energies is examined. The structure of nuclei and the reaction mechanisms of strongly interacting systems is studied. Arguments for the applicability of the distorted wave t-matrix approximation to the reaction mechanism are given. Three ingredients for theoretical calculations, the transition operator, the optical potential, and the requisite nuclear structure information, are discussed. The generation of an optical potential from

first order multiple scattering theory is described and results for the antisymmetrization terms are analyzed. Dissert. Abstr.

N80-10880 Illinois Univ. at Chicago Circle, Chicago.
MICROSCOPIC CLASSICAL EQUATIONS OF MOTION CALCULATIONS OF HIGH-ENERGY HEAVY-ION COLLISIONS Ph.D. Thesis
Constantine N. Panos 1979 253 p
Avail: Univ. Microfilms Order No. 7923025

Classical microscopic nonrelativistic calculations for collisions between equal mass nuclei projectile and target and between nuclei are discussed. The trajectories of all nucleons are calculated classically with two body forces between all pairs of nucleons. The implementation of the classical equations of motion calculations is presented and four aspects, the choice of the 2 body potentials, choice of initial configurations, the A body trajectory calculations, and the analysis of these are investigated. Dissert. Abstr.

N80-10881# Virginia Univ., Charlottesville. Dept. of Physics.
EXPERIMENTS ON THE NUCLEAR INTERACTIONS OF PIONS *Progress Report, 1 Dec. 1977 - 30 Nov. 1978*
R. C. Minehart and K. O. H. Ziock 1978 42 p refs
(Contract EY-76-S-05-4043)
(ORO-4043-38) Avail: NTIS HC A03/MF A01

Experimental research in pion reactions is summarized. A list of publications is included. DOE

N80-10882# Texas Univ., Austin. Center for Particle Theory.
PRODUCTION AND DETECTION OF NEW NEUTRINOS
D. A. Dicus, E. W. Kolb, H. J. Lubatti, and V. L. Teplitz Oct. 1978 42 p refs
(Contract EY-76-S-05-3992)
(ORO-3992-346) Avail: NTIS HC A03/MF A01

The implications of an electromagnetic transition moment for production and decay of massive neutral leptons are considered. Rates for disconnected gamma and disconnected e(+) e(-) pair events from electromagnetic production and decay of Nu sub H are calculated. Production is considered both in the neutrino beam shielding and production in the detector apparatus. The rates expected from three classes of plausible models are compared with the rates that are detected by present generation experiments. DOE

N80-10883# Stanford Linear Accelerator Center, Calif.
HEAVY LEPTON PHENOMENOLOGY
M. L. Perl Nov. 1978 59 p refs
(Contract EY-76-C-03-0515)
(SLAC-Pub-2219) Avail: NTIS HC A04/MF A01

An empirical definition of a charged lepton is presented using the properties of the electron and muon. For this purpose the evidence is surveyed that the electron and muon are elementary particles without constituents. Some of the evidence is discussed that these particles do not partake of the strong interactions. A similarly empirical discussion is given of neutrinos. Only enough theory is given to provide a basis for the discussion of the tau lepton, for which the properties and areas for future research are considered. Limits are reviewed from past searches on the existence of other types of heavy leptons, and the extensions of such searches are discussed. DOE

N80-10884# Sandia Labs., Albuquerque, N. Mex. Fuel Cycle Risk Analysis Div.
RISK METHODOLOGY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE WASTE: THE SANDIA WASTE ISOLATION FLOW AND TRANSPORT (SWIFT) MODEL
R. T. Dillon, Ronald B. Lantz (INTERA Environ. Consultants, Inc.), and Suresh B. Pahwa (INTERA Enwrion. Consultants, Inc.) Oct. 1978 108 p refs
(Contract EY-76-C-04-0789)
(SAND-78-1267; NUREG-CR-0424) Avail: NTIS HC A06/MF A01

A three-dimensional finite difference model (SWIFT) developed to simulate the transport by ground water of trace concentration of radioisotopes is described. The model was developed for use in the analysis of deep geological nuclear waste disposal facilities. It is based upon an existing model which treats the injection of liquid chemical wastes into deep saline aquifers. Complete documentation of SWIFT is provided. Comparison of SWIFT results with the analytical solution for constant velocity and diffusivity condition and with the ORIGEN code results for static conditions is presented. A discussion of possible future developments is given. DOE

N80-10885# Georgia Univ., Athens. Dept. of Physics and Astronomy.
SUBGROUP REPORT ON ALTERNATIVE TECHNOLOGY STRATEGIES FOR THE ISOLATION OF NUCLEAR WASTE
Oct. 1978 241 p refs
(TID-28818) Avail: NTIS HC A11/MF A01

Programmatic approaches to the disposal of high level and transuranic contaminated wastes are discussed. The dimensions and types of nuclear wastes are examined and the problem of waste management is addressed. Candidate technologies for nuclear waste disposal are emplacement in mined repositories, emplacement in ocean sediments, emplacement in deep drill holes, and ejection into space. A.W.H.

N80-10886# Los Alamos Scientific Lab., N. Mex.
GENERAL-PURPOSE HEAT SOURCE PROJECT, SPACE NUCLEAR SAFETY PROGRAM, AND RADIOISOTOPIC TERRESTRIAL SAFETY PROGRAM
R. D. Baker, comp. Sep. 1978 38 p
(Contract W-7405-eng-36)
(LA-7560-PR) Avail: NTIS HC A03/MF A01

Studies related to the use of (Pu-238)02 in radioisotopic power systems carried out for the Advanced Systems and Materials Division by the Los Alamos Scientific Laboratory are discussed. DOE

N80-10887# California Univ., Berkeley. Lawrence Berkeley Lab.
NEW PARTICLES, THEORETICAL
J. D. Jackson (Fermi Natl. Accelerator Lab., Batavia, Ill.), C. Quigg (Fermi Natl. Accelerator Lab., Batavia Lab., Ill.), and J. L. Rosner (Minnesota Univ., Minneapolis) Sep. 1978 56 p refs Presented at the 19th Conf. on High Energy Phys., Tokyo, 23 Aug. 1978 Submitted for publication
(Contract W-7405-eng-48)
(LBL-7977; Conf-780826) Avail: NTIS HC A04/MF A01

Various topics in high energy physics are covered. The Q anti Q interaction and charmonium, implications of the upsilon states, and weak decays of heavy quarks are included. DOE

N80-10888# Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
EXPERIMENTAL JOULE-HEATED CERAMIC MELTER FOR CONVERTING RADIOACTIVE WASTE TO GLASS
Paul H. Chrismar 1978 18 p refs Presented at ANS Meeting, Washington, D. C., 12 Nov. 1978
(Contract EY-76-C-09-0001)
(DP-MS-78-59; Conf-781105-76) Avail: NTIS HC A02/MF A01

A small electric melter was developed to implement studies for converting radioactive waste to glass at the Savannah River Laboratory (SRL). During its 10 months of operation, the ceramic-lined, jouleheated melter processed simulated, high-level-waste, calcined materials and frit at rates of 2 to 15 g/min. The melt chamber is 7.6 cm wide, 22.9 cm long and 7.6 cm deep. The total power consumption is 3.5 KVA when the glass processing temperature is 1150 C. A similar unit will be in operation in FY-1979 in the SRL high-level cells. DOE

N80-10889# Idaho National Engineering Lab., Idaho Falls.
APPLICATION OF MICROWAVE ENERGY TO POST-CALCINATION TREATMENT OF HIGH-LEVEL NUCLEAR WASTES
S. J. Priebe, T. C. Piper, and J. R. Berreth Feb. 1979 34 p refs
(Contract EY-76-C-07-1570)
(ICP-1183) Avail: NTIS HC A03/MF A01

The drying of a pelleted waste and vitrifying of a calcined waste by microwave heating were investigated. Tests show pellet drying by microwave energy to be superior to drying by conventional methods. Vitrification by microwave energy gave a uniform glass in less time than radiant energy. DOE

N80-10890# Oak Ridge National Lab., Tenn.
DEVELOPMENT OF CERMETS FOR HIGH LEVEL RADIOACTIVE WASTE FIXATION
W. S. Aaron, T. C. Quinby, and E. H. Kobisk 1979 15 p refs Presented at the Intern. Symp. on Ceram. in Nucl. Waste Management, Cincinnati, 30 Apr. 1979
(Contract W-7405-eng-26)
(CONF-790420-10) Avail: NTIS HC A02/MF A01

A method for the solidification and fixation of commercial and defense high-level radioactive wastes, namely a cermet process, is described. Chemical and physical processing techniques, the subsequent properties of the resulting cermet bodies, unique and advantageous features of the cermet waste form, and the conversion process are discussed. DOE

N80-10891# Nuclear Services Corp., Campbell, Calif.
RISK ANALYSIS METHODOLOGY AND DATA: STUDY OF ALTERNATIVES FOR LONG-TERM MANAGEMENT OF HANFORD DEFENSE HIGH-LEVEL RADIOACTIVE WASTE
Sep. 1978 176 p refs
(Contract EY-77-C-06-1001)
(NSC-PS-ARH-77001) Avail: NTIS HC A09/MF A01

The risk analysis was done on a modular basis. The modules include: waste retrieval, waste preparation, waste immobilization, transportation, and storage and disposal. Based on the values obtained, it is apparent that the overall risk either to an individual or to the population is extremely low. DOE

N80-10892# Sandia Labs., Albuquerque, N. Mex.
SAFEGUARDS METHODOLOGY DEVELOPMENT HISTORY
L. D. Chapman, H. A. Bennett, D. Engi, L. M. Grady, B. L. Hulme, and D. W. Sasser 1979 11 p refs Presented at the 1st Ann. Symp. on Safeguards and Nucl. Mater. Management, Brussels, 25 Apr. 1979
(Contract DE-AC04-76DP-00789)
(SAND-79-0059C; Conf-790430-14) Avail: NTIS HC A02/MF A01

The development of models for the evaluation and design of fixed site nuclear facility, physical protection systems is discussed. The evolution of these models and the model descriptions are presented. DOE

N80-10893# Sandia Labs., Albuquerque, N. Mex. Theoretical Div.
MODIFIED METHOD OF PERTURBED STATIONARY STATES 1
T. A. Green Oct. 1978 106 p refs
(Contract EY-76-C-04-0789)
(SAND-78-0235) Avail: NTIS HC A06/MF A01

The reaction coordinate approach of Mittleman is used to generalize the method of perturbed stationary states. A reaction coordinate is defined for each state in the scattering expansion in terms of parameters which depend on the internuclear separation. These are to be determined from a variational principle described by Demkov. The variational result agrees with that of Bates and McCarroll in the limit of separated atoms, but is generally different elsewhere. The theory is formulated for many-electron systems, and the construction of the scattering expansion is discussed for simple one-, two-, and three-electron system. The scattering expansion and the Lagrangian for the radial scattering functions are given in detail for a heteronuclear one-electron system. DOE

N80-10894# California Univ., Berkeley. Lawrence Berkeley Lab.
MULTIPION PRODUCTION IN NUCLEAR COLLISIONS
Miklos Gyulassy Mar. 1979 13 p refs Presented at Intern. Conf. on Meson-Nuclear Phys., Houston, Tex., 5 Mar. 1979
(Contract W-7405-eng-48)
(LBL-8758; Conf-790347-6) Avail: NTIS HC A02/MF A01

Multipion production in nuclear collisions is discussed. The negative pion multiplicity distribution and the pi(-)pi(-) correlation function is examined. How these observables are used to search for signals of collective phenomena in nuclear collisions is investigated. DOE

N80-10895# California Univ., Berkeley. Lawrence Berkeley Lab. Nuclear Science Div.
ROLE OF DEEP INELASTIC PROCESSES IN NUCLEAR PHYSICS: EXPERIMENTAL AND THEORETICAL ASPECTS OF DEEP INELASTIC REACTIONS
L. G. Moretto Mar. 1979 62 p refs Presented at Intern. Conf. on Dynamical Properties of Heavy Ion Reactions, Johannesburg, Aug. 1978
(Contract W-7405-eng-48)
(LBL-8936) Avail: NTIS HC A04/MF A01

The collective modes excited in deep inelastic reactions and their natural hierarchy provided by their characteristic relaxation times is described. The relaxation of the mass asymmetry mode is discussed in terms of a diffusion process. Charge distributions and angular distributions as a function of Z are calculated. The transfer of energy and angular momentum is discussed in terms of particle transfer, and is compared with gamma ray multiplicities as a function of both Q value and mass asymmetry. The angular momentum transfer is considered in connection with the sequential fission of heavy, deep inelastic fragments and the excitation of collective modes in the exit channel is considered. The role of the giant E1 mode in the equilibration of the neutron to proton ratio is discussed. DOE

N80-10896# Stanford Univ., Calif.
EXPERIMENTAL REVIEW OF BEAM POLARIZATION IN HIGH ENERGY POSITRON ELECTRON STORAGE RINGS
R. F. Schwitters Feb. 1979 19 p refs Presented at the Symp. on High Energy Phys., Argonne, Ill, 26 Oct. 1978
(Contract EY-76-C-03-0515)
(SLAC-Pub-2258; Conf-781095-6) Avail: NTIS HC A02/MF A01

Information that is provided by beam polarization in high energy e(-)e(+) interactions, how polarized beams are produced, the experimental evidence for radiative beam polarization, and the results which were obtained to date, using polarized beams are reviewed. Prospects for beam polarization experiments in future generations of storage rings are discussed. DOE

N80-10897# Washington State Univ., Pullman.
IMMOBILIZATION OF HAZARDOUS RESIDUALS BY *ENCAPSULATION Final Report*
R. V. Subramanian and R. Mahalingam Feb. 1979 212 p refs
(Grant NSF ENV-76-06583)
(PB-296642/2; NSF/RA-790046) Avail: NTIS HC A10/MF A01 CSCL 13B

The feasibility of encapsulating hazardous aqueous wastes in a water-extensible polyester matrix for land burial was demonstrated. Laboratory experiments conducted to determine the leachability of encapsulated wastes indicate that the polyester matrix can be used safely to immobilize low-level radioactive wastes. In addition, acceptable low levels of leachabilities can be achieved for solid wastes incorporated in the matrix. A polyester matrix is much more efficient than cement or urea-formaldehyde polymers in containing wastes. A pilot plant was conducted to handle 15 gal/hr liquid waste. Polymerization was readily controllable, and process upsets were easily handled. An economic evaluation of the polyester process shows it to be two-and-one-half times more expensive than its nearest competitor, the cement silicate process, the major cost item being the polyester resin. GRA

74 OPTICS

Includes *light phenomena*.

N80-10898 Ohio State Univ., Columbus.
THE SPHERICAL WAVE PHASE DIFFERENCE TEMPORAL *POWER SPECTRA FOR LIGHT BEAMS DEGRADED BY A* TURBULENT ATMOSPHERE Ph.D. Thesis
George William Reinhardt 1979 173 p
Avail: Univ. Microfilms Order No. 7922545

A general theory is developed for an arbitrary angle between the phase point measurements and the wind direction. The theory allows for wind velocity, wind direction, turbulence strength and outer scale variations along the beam path. Calculations were performed for real world wind velocities and directions, along

with typical outer scale and turbulence strength variations that are encountered along slant and vertical paths. Approximate and computer solutions for horizontal path temporal spectra are obtained in terms of a set of dimensionless variables. Calculations are performed for vertical paths along which the path variables, wind direction, wind velocity, outer scale of turbulence and turbulence strength change significantly. A three layer wind profile was developed. Both plane wave and spherical wave temporal spectra are calculated for actual radiosonde wind data. Differential path contribution data are also calculated. Dissert. Abstr.

N80-10899 Lowell Univ., Mass.
MAGNETO-OPTICAL STUDIES OF PARAMAGNETIC SYSTEMS TO DETERMINE THEIR POTENTIAL FOR USE AS CONTINOUSLY TUNABLE COHERENT FAR-INFRARED SOURCES Ph.D. Thesis
Shobhana Subnash Madan 1979 94 p
Avail: Univ. Microfilms Order No. 7923002

High resolution spectroscopic studies on paramagnetic systems having zero field splittings in the far infrared region are reported. Dependence of the transition energies on high magnetic fields (up to 50 kG) are studied for different orientations of the crystal with respect to the magnetic field. The minima of certain transitions and the splitting of some transition energies for fields above 20 kG are discussed. Variation of the transition energies as a function of magnetic field and orientation using an 8 by 8 numerical Hamiltonian matrix is examined.
Dissert. Abstr.

N80-10900 Rochester Univ., N. Y.
DESIGN, ENGINEERING, AND MANUFACTURING ASPECTS OF GRADIENT INDEX OPTICAL COMPONENTS Ph.D. Thesis
Stephen Dennis Fantone 1979 330 p
Avail: Univ. Microfilms Order No. 7922929

The fifth order aberration coefficients for gradient index lenses derived using Lagrangian methods are discussed. The aberrations of lenses containing spherical gradients are considered. The radius of curvature of the gradient is demonstrated to be an extra degree of freedom. The fabrication process of gradient materials is studied and models are devised for describing the refractive index, spectral, and mechanical properties of gradient index materials. Dissert. Abstr.

N80-10901 Rochester Univ., N. Y.
FRUSTRATED TOTAL REFLECTION POLARIZER FOR THE INFRARED Ph.D. Thesis
David Eric Berman Lees 1979 151 p
Avail: Univ. Microfilms Order No. 7922944

Middle infrared polarizers are reviewed and a polarizer based on the differential phase shift upon reflection from a frustrated total reflection layer is described. A design technique developed for multiple cavity frustrated total reflection polarizers is discussed. A numerical example of polarizer design is given. The fabrication and testing of a three cavity frustrated total reflection polarizer working at carbon dioxide laser wavelengths is described.
Dissert. Abstr.

N80-10902 California Inst. of Tech., Pasadena.
SERRATED APERTURES: STATISTICAL DIFFRACTION THEORY AND EXPERIMENTS Ph.D. Thesis
George Michael Morris 1979 169 p
Avail: Univ. Microfilms Order No. 7922052

Diffraction of monochromatic light by rough apertures is analyzed. Correlation functions are derived for the electric field and for the intensity in the optical transform plane. Solutions are presented for serrated edges and gaps. Both space and wavelength dependences are included and solutions for cross correlations of electric field and intensity are obtained. The optical transforms of serrated and sharp edges are contrasted. The edge statistics, determined by processing the transform plane intensity measurements are discussed and edge roughness (or standard deviation), established from transform plane measurements along the central spike is examined. Dissert. Abstr.

N80-10903 Texas Univ. at Dallas, Richardson.
X-RAY TOMOGRAPHY BY OPTICAL RECONSTRUCTION FROM PROJECTIONS Ph.D. Thesis
Robert Calvin Murry 1979 205 p
Avail: Univ. Microfilms Order No. 7921339

The potential of optical reconstruction of tomograms from X-ray projection data was investigated. A linear scanning geometry, well suited to the recording of projection data onto film, was suggested. An encoding-decoding scheme for reconstruction was proposed, and some potential methods of filtering for image enhancement were introduced. The investigation of filters led to several methods of reconstruction by optical back-projection, both with and without filtering. Each of the different reconstruction techniques offered one or more of the following: (1) faster reconstruction than computerized axial tomography (CAT), (2) higher spatial resolution than CAT, (3) better contrast than conventional tomography, or (4) multiple-plane reconstruction for the same dose as a conventional tomography single-plane image. None of the optical techniques appeared to offer better contrast or a cheaper system than CAT, or to offer better resolution than conventional tomography. Dissert. Abstr.

N80-10904 Polytechnic Inst. of New York.
SECOND-ORDER PERTURBATION THEORY FOR FABRY-PEROT RESONATORS Ph.D. Thesis
John Lucien Remo 1979 111 p
Avail: Univ. Microfilms Order No. 7920799

The computation of additional power losses and phase shifts caused by perturbations of optical resonators is presented. The numerical results for flat strips, curved strips, flat discs, and curved discs are calculated and the values for the unperturbed eigenvalues and eigenfunctions for each of these configurations are determined. The diffraction power losses for tilted resonators with both circular and strip flat reflectors is computed for several tilt angles. A second order perturbation which is sinusoidally periodic for both the infinite strip reflector as well as for the circular disc reflector is determined. The computation for obtaining the scattered (radiation) power over several modes to estimate the laser resonator beam quality is discussed. Dissert. Abstr.

N80-10905 California Univ., San Diego.
AN EXPERIMENTAL STUDY OF OPTICAL PHASE FLUCTUATIONS IN A RANDOM REFRACTIVE FIELD Ph.D. Thesis
Richard Lynne Sandstrom 1979 174 p
Avail: Univ. Microfilms Order No. 7921493

The phase perturbations induced in a laser beam as it propagates 0.52 m through a thermally induced random refractive field is studied using a heated grid subsonic turbulence tunnel. A dual beam laser heterodyne interferometer is used for the phase measurements. The refractive field along two parallel ray paths is studied. Single and two path statistics over a mutual separation distance which is variable from 1 mm to about 8 cm are discussed. Theoretical integral equations relating the temperature spectrum to several statistical functions of the phase fluctuation are developed. The special case in which the temperature spectrum is represented by an inverse power-law of unspecified exponent is considered. Phase statistics measured include the root mean square, structure functions, absolute phase power spectrum, relative phase power spectrum for both longitudinal and transverse beam separations, longitudinal space time autocorrelation, phase, and coherence functions.
Dissert. Abstr.

N80-10906 Arizona State Univ., Tempe.
FEEDBACK SYSTEMS FOR IMAGE ACQUISITION AND PROCESSING Ph.D. Thesis
Nobuhiko Tamura 1979 149 p
Avail: Univ. Microfilms Order No. 7921820

The application of feedback methods to imaging systems was investigated. The methodologies that introduce a feedback loop to imaging systems were explored in two areas: (1) coherent optical feedback methods and (2) optoelectronic hybrid feedback methods. In the coherent optical feedback methods, a Fabry-Perot optical cavity, or a pair of partially reflective parallel mirrors, were used to form a feedback loop in which an optical beam with long temporal coherence traveled back and forth. In optoelectronic hybrid feedback methods, incoherent imaging optics used for convolution operations and electronics are used for subtraction operations. The dodging technique practiced by photographic technicians in the printing process is studied as an example of hybrid feedback methods. A mathematical model

is formulated and an optoelectronic model is built. The use of image transducers as active components of a hybrid feedback system are examined. Dissert. Abstr.

N80-10907*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
REFRACTION CORRECTIONS FOR SURVEYING
William M. Leer (TRW) Aug. 1979 20 p refs
(NASA-TM-80803; Rept-79-FM-27; JSC-16084) Avail: NTIS HC A02/MF A01 CSCL 20F

Optical measurements of range and elevation angle are distorted by the earth's atmosphere. High precision refraction correction equations are presented which are ideally suited for surveying because their inputs are optically measured range and optically measured elevation angle. The outputs are true straight line range and true geometric elevation angle. The 'short distances' used in surveying allow the calculations of true range and true elevation angle to be quickly made using a programmable pocket calculator. Topics covered include the spherical form of Snell's Law; ray path equations; and integrating the equations. Short-, medium-, and long-range refraction corrections are presented in tables. A.R.H.

N80-10908*# National Aeronautics and Space Administration, Washington, D. C.
TEMPERATURE DEFORMATIONS OF THE MIRROR OF A RADIO TELESCOPE ANTENNA
V. I. Avdeyev, S. A. Grach, K. Kh. Kozhakhmetov, and F. I. Kostenko Jun. 1979 15 p refs Transl. into ENGLISH of "Temperaturnyye Deformatsii Sostavnogo Zerkala Antenny Radioteleskopa". Rept. PR-412 Acad. of Sci. USSR, Inst. of Space Res., Moscow, 1978 p 1-19 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(NASA-TM-75833; PR-412) Avail: NTIS HC A02/MF A01 CSCL 20F

The stress informed state of the mirror of an antenna, with a diameter of 3 m, for a radio interferometer used in space, and located in a temperature field is examined. The mirror represents a parabolic shell, consisting of 19 identical parts. The problem is based on representations of the thermoelasticity of thin shells. A.W.H.

N80-10909# Honeywell Systems and Research Center, Minneapolis, Minn. Systems and Research Center.
FIBER OPTICS TRANSMITTER INTEGRATED CIRCUIT DEVELOPMENT Final Report, Jun. 1978 - Dec. 1977
Ben R. Elmer Jul. 1978 130 p refs
(Contract F33615-76-C-1280; AF Proj. 6096)
(AD-A071437; F0470-FR; AFAL-TR-78-107) Avail: NTIS HC A07/MF A01 CSCL 20/6

This report describes the development of the Fiber Optic Transmitter Integrated Circuit (FOTIC) from synthesis through analysis, layout, processing, packaging, and testing the 1050 parts that were delivered. Detailed test, burn-in, and qualification plans are also included. One of the highlights of this report is an Application Information section, written to inform users of the characteristics of the device that are not apparent from reading the specification. GRA

N80-10910# North Dakota State Univ., Fargo. Dept. of Electrical and Electronics Engineering.
USE OF PREDISTORTION TO REDUCE INTERMODULATION DISTORTION IN OPTICAL FIBER COMMUNICATION SOURCES Final Report, Mar. 1978 - May 1979
Gary L. Larson and Donald A. Smith May 1979 84 p
(Grant AF-AFOSR-3554-78)
(AD-A072637; AFOSR-79-0904TR) Avail: NTIS HC A05/MF A01 CSCL 20/6

Optical fiber communication is a new technology which has the potential of surpassing conventional communication techniques in many applications. One problem area is the introduction of distortion produced by nonlinearities in the system. Light-emitting diodes, used as sources in optical communication systems, are the main contributors of the nonlinearities. A procedure for compensating for the nonlinearity of an LED is developed. An optical receiver and LED transmitter were constructed to measure the light intensity vs LED current characteristic of various LEDS. The static and dynamic characteristics of each of the LEDS were measured. A polynomial describing the dynamic characteristic is used to predict the intermodulation distortion vs percent modulation. Measurements of the intermodulation components of the received signal at different depths of modulation show a close correlation to the calculated values. A predistortion approach to compensating for the nonlinearity of the LED is pursued. Using the LED characteristic, a means of determining the parameters of the compensating network is sought. These parameters are used and measurement of the overall linearity of the system is again checked and compared to that of the uncompensated system. GRA

N80-10911# Los Alamos Scientific Lab., N. Mex.
PROPOSAL FOR THE THEORETICAL INVESTIGATION OF LIGHT-ION BEAM PROPAGATION THROUGH A RESIDUAL PLASMA ENVIRONMENT
L. E. Thode and E. L. Lindman Feb. 1979 20 p refs
(Contract W-7405-eng-36)
(LA-7590-P) Avail: NTIS HC A02/MF A01

An investigation of ion beam propagation in residual plasma is proposed in order to: (1) gain insight into the nonlinear physics of microinstabilities associated with a well collimated ion beam propagating through a plasma, (2) isolate parameter regimes where problem areas for propagation appear to exist; and (3) suggest techniques to overcome any problems. A strong interplay between theory and two dimensional, electromagnetic particle in cell simulation is emphasized. DOE

N80-10912# Los Alamos Scientific Lab., N. Mex.
FIBER OPTIC UTILIZATION AT THE NEVADA TEST SITE
P. B. Lyons, J. E. Golob, L. D. Looney, R. E. Robichaud (EG&G, Inc., Los Alamos, N. Mex.), M. A. Nelson (EG&G, Inc., Goleta, Calif.), and T. J. Davies (EG&G, Inc., Goleta, Calif.) Nov. 1978 12 p refs
(Contract W-7405-eng-36)
(LA-7029-MS) Avail: NTIS HC A02/MF A01

Optical fiber cables were successfully used for 100 MHz analog data transmission during an underground nuclear test at the Nevada Test Site. Two 700 m cables provided thirteen single fiber data channels from the vicinity of the underground detonation, 350 meters below ground level, to recording instrumentation, 350 meters from the downhole shaft. No fiber performance degradation was observed during the extensive procedures used to seal the shaft. These procedures included backfilling the shaft with layers of sand and gravel, as well as poured epoxy plugs. Techniques were developed for internal sealing of the cable to prevent any possible radioactive gas flow through voids within the cable. The effects on optical fibers of intense, pulsed neutron and gamma irradiation were studied. Specialized tools, including a system for location of faults or breaks in the optical fibers, were developed. DOE

N80-10245*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A VOLTAGE-CONTROLLED OPTICAL RADIO FREQUENCY-PHASE SHIFTER
K. Y. Lau *In its* The Deep Space Network 15 Oct. 1979 p 24-32 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 20F

N80-10248*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE R SUB 0 PARAMETER FOR OPTICAL COMMUNICATION USING PHOTON COUNTING
R. J. McEliece *In its* The Deep Space Network 15 Oct. 1979 p 62-65 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 20F

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N80-10913 Rochester Univ., N. Y.
A STUDY OF SOFT X-RAY LASER SCHEMES IN MULTI-COMPONENT LASER PLASMAS Ph.D. Thesis
Venkata Adiseshaiah Bhagavatula 1978 187 p

Avail: Univ. Microfilms Order No. 7922919

Soft X-ray population inversion studies by recombination and resonant photoexcitation processes were conducted. Highly ionized, multi component plasmas produced by high power glass laser were employed in the experiments. Population inversions, sufficient for observable gains were shown to exist at wavelengths below 140 A. Computational models were formulated to study the inversion schemes. Excited state models were used to analyze the soft X-ray inversion schemes. The hydrogenic and the helium like excited state populations for a variety of laser produced plasma parameters were determined. The excited state models, coupled with hydrodynamic and ionization codes, were used to predict temporal and spatial profiles of the electron temperature and densities, resultant population inversions and gains in helium like and hydrogen like ions of Mg and Al. Dissert. Abstr.

N80-10914*# National Aeronautics and Space Administration, Washington, D. C.

ESTABLISHMENT OF THE SPECTRA OF KINETIC TURBULENCE

L. A. Bolshov, A. M. Dykhne, V. P. Kiselev, and A. Kh. Pergament Aug. 1979 28 p Transl. into ENGLISH of "Ustanovleniye Spektrov Kineticheskoy Turbulentinosti" (Moscow), Preprint no. 31, 1979 30 p Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prepared by Academy of Sciences (USSR), Moscow

(Contract NASw-3199)

(NASA-TM-75666) Avail: NTIS HC A03/MF A01 CSCL 20I

An analysis of kinetic equations describing the establishment of Langmuir turbulence spectra is presented. Secondary turbulence occurs where stationary distribution consists of many peaks. The position of peaks is established and their amplitudes complete undamped oscillations. It is pointed out that establishing spectra can occur only during adiabatic inclusion of pumping. It is significant here that the adiabatic condition is more rigid than the ordinary by several hundred times. R.E.S.

N80-10915*# National Aeronautics and Space Administration, Washington, D. C.

NUMERICAL EXPERIMENTS ON THE THETA PINCH

P. P. Volosevich and G. G. Zukakishvili Oct. 1979 18 p refs Transl. into ENGLISH of "Chislennyye Eksperimenty po Teta-Pinchu", Prep. No. 47 Acad. of Sci. USSR, Inst. of Appl. Math., Moscow, 1979 p 1-30 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3199)

(NASA-TM-75694) Avail: NTIS HC A02/MF A01 CSCL 20I

Numerical calculation of theta pinch problems are presented. Physical processes in theta pinch systems are considered in a one dimensional, two temperature magnetohydrodynamic, approximation with allowance for end losses by longitudinal heat conductivity. The numerical calculations are compared with results of earlier experiments. A.W.H.

N80-10916# Sandia Labs., Livermore, Calif.

ALPHA TRANSPORT AND BLISTERING IN TOKAMAKS

W. Bauer, K. L. Wilson, C. L. Bisson, L. G. Haggmark (Princeton Univ.), and R. J. Goldston Dec. 1978 40 p refs

(Contract EY-76-C-04-0789)

(SAND-78-8684) Avail: NTIS HC A03/MF A01

The particle flux and angular distribution of 3.5 MeV alpha particles impinging on the first wall from uncontained banana orbits in an axisymmetric Tokamak reactor were calculated. The resulting helium concentration profiles in the first wall can give rise to surface exfoliation under specified conditions. The major mitigating factor is the simultaneous surface recession due to sputtering by the D-T charge exchange neutral flux. For the parameters used in these calculations, blistering in high sputtering rate materials such as Be is unlikely whereas in low sputtering rate materials such as Nb, He induced surface deformation is quite probable. DOE

N80-10917# Argonne National Lab., Ill.

TELESCOPING BEAMS FOR HEAVY ION FUSION

R. J. Burke 1979 5 p refs Presented at IEEE Particle Accelerator Conf., San Francisco, 12 Mar. 1979

(Contract W-31-109-eng-38)

(CONF-790327-100) Avail: NTIS HC A02/MF A01

Enhancement of the design for heavy ion fusion drivers by telescoping bunches of different ion species is considered. Telescoping is defined as the overtaking and interpretation of bunches consisting of ions of different species but whose velocity, mass, and charge state have been selected so that the typical ions in the various bunches have the same ratio of momentum to charge, or magnetic rigidity, and, therefore, the same single particle dynamics in transport and focussing lines. With velocities differing by 10% or more, the highest powers would only arise close to the end of the transport lines. Telescoping also increases the total available phase space of the different species. This can be translated to a smaller final momentum spread or a means to accommodate greater phase space dilution. DOE

N80-10918# Argonne National Lab., Ill.

POWER SUPPLY REQUIREMENTS FOR A TOKAMAK FUSION REACTOR

Jeffrey N. Brooks and Robert L. Kustom Feb. 1979 63 p refs

(Contract W-31-109-eng-38)

(ANL/FPP/TM-119) Avail: NTIS HC A04/MF A01

A system approach combining models of the reactor and poloidal coil set, plasma burn cycle and MHD calculations, and power supply characteristics and cost data was used to determine power supply requirements for a 7-M major radius commercial reactor. A conventional system using an MGF set and solid-state rectifier/inverter power supplies was studied in addition to systems using a homopolar generator, superconducting energy storage inductor, and dump resistors. The requirements and cost of the power supplies depend on several factors but most critically on the ohmic heating ramp time used for startup. Long ramp times (approximately > 85) seems to be feasible, from the standpoint of resistive voltsecond losses, and would appear to make conventional systems quite competitive with nonconventional ones, which require further research and development. DOE

N80-10919# Westinghouse Electric Corp., Pittsburgh, Pa.

STAINLESS STEEL BLANKET CONCEPT FOR TOKAMAKS

J. S. Karbowski, A. Y. Lee, T. V. Prevenslik, G. W. Ruck, and T. E. Shannon (ORNL) 25 Jan. 1979 6 p refs Presented at ANS Ann. Meeting, Atlanta, Ga., 3 Jun. 1979

(WFPS-TME-79-010; Conf-790602-32) Avail: NTIS HC A02/MF A01

A design concept for a Tokamak reactor blanket system which satisfies engineering requirements for a utility environment is discussed. Reliability, fabricability, and lifetime are emphasized. DOE

N80-10920# Northwestern Univ., Evanston, Ill.

COMPUTER SIMULATION OF KINETIC PROPERTIES OF PLASMA Progress Report, 1 Oct. 1977 - 30 Sep. 1978

J. Denavit 1978 8 p

(Contract EY-76-S-02-2200)

(COO-2200-10) Avail: NTIS HC A02/MF A01

The development and testing of new numerical methods for particle and hybrid simulation of plasmas and their application to physical problems of current significance to magnetic fusion energy is addressed. Research on the following specific problems is reported: (1) analysis and computer simulations of the dissipative trapped electron instability in Tokamaks; (2) long-time-scale algorithms for numerical solutions of the drift-kinetic equation; and (3) computer simulation of field-reversed ion ring stability. DOE

N80-10921# Oak Ridge National Lab., Tenn.

STUDY OF A TOKAMAK CLEANING METHOD UTILIZING GLOW DISCHARGE

N. N. Brevnov, R. Clausing, A. A. Kazachkov, and N. V. Kuznetsov 1979 10 p refs Transl. into ENGLISH of Report IAE-3100 (Moscow), from Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, 1979 10 p

(ORNL-TR-4664; IAE-3100) Avail: NTIS HC A02/MF A01

The effect of glow discharge cleaning on the Tokamak T-12 wall surfaces and residual gas composition in the apparatus working chamber was studied. Auger spectroscopy was the diagnostic technique employed. DOE

N80-10922# Brookhaven National Lab., Upton, N. Y. Dept. of Nuclear Energy.
ONE- AND TWO-DIMENSIONAL HEATING ANALYSES OF FUSION SYNFUEL BLANKETS
J. S. K. Tsang, O. W. Lazareth, and J. R. Powell 1979 5 p refs Presented to the Am. Nucl. Soc., Atlanta, Ga. 3-8 Jun. 1979
(Contract EY-76-C-02-0016)
(BNL-NUREG-25635; Conf-790602-14) Avail: NTIS HC A02/MF A01

Neutronics and heating analyses were performed on a fusion reactor blanket featuring synthetic fuel production. In this two temperature region blanket design, the structural shell is stainless steel. The interior of the module is a packed ball of high temperature ceramic material. The low temperature shell and the high temperature ceramic interior are separately cooled. Process steam (approximately 1500 C) is then produced in the ceramic core for the producion of H2 and H2-based synthetic fuels by a high temperature electrolysis (HTE) process. DOE

N80-10923# Wisconsin Univ., Madison. Dept. of Nuclear Engineering.
FAST MAGNETOSONIC WAVE HEATING OF THE NUWMAK TOKAMAK REACTOR
J. E. Scharer, D. T. Blackfield, J. B. Beyer, and T. K. Mau Jun. 1978 141 p refs
(Contract ET-78-C-02-4710)
(UWFDM-227) Avail: NTIS HC A07/MF A01

The radiofrequency (RF) coupling and heating-to-ignition of a conceptual Tokamak fusion reactor by means of the fast magnetosonic wave at the second ion cyclotron harmonic is discussed. The current status of fast magnetosonic wave propagation and heating, mode conversion, and eigenmode theory is briefly reviewed. A space-averaged, time-dependent startup model is used to describe the role of RF heating for ignition of a Tokamak reactor. DOE

N80-10924# Addis Translations International, Portola Valley, Calif.
ELECTRON TRANSFER IN A SUPERDENSE NONDEGENERATE PLASMA
V. V. Ermakov and N. N. Kalitkin Mar. 1979 34 p refs Transl. into ENGLISH of "Elektronnyi Perenos v Sverkhplotnoi Nevyrozhdennoi Plasme" Acad. of Sci. USSR, Inst. of Appl. Math., Moscow, 1977 44 p
(UCRL-Trans-11473) Avail: NTIS HC A03/MF A01

A physical model is suggested which describes the conductivity and electron heat conductivity of an equilibrium, nondegenerate plasma in the density range from gas densities to superhigh densities, and at all temperatures. In this model, the degree of ionization of the matter is found on the basis of the static Thomas-Fermi model of the atom with quantum and exchange corrections. The interaction of the charged particles, which may be quite strong, is described by the Debye potential. The transport coefficients are determined from the Boltzmann equation in the fourth approximation of Chapman and Enskog, and quantum effects are used to calculate the scattering cross sections. This method is used to calculate the transfer properties of a number of substances (Be, Al, Si, Ar, Cu, Xe, Cs, Pb, SiO2, NaCl) at densities of 10 to the 17th power/cubed centimeters to 10 to the 24th power/cubed centimeters. DOE

76 SOLID-STATE PHYSICS

Includes superconductivity.
For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N80-10925 Pennsylvania State Univ., University Park.
ATOM-SURFACE INTERACTIONS DERIVED FROM SCATTERING DATA Ph.D. Thesis
William Edward Carlos 1979 128 p
Avail: Univ. Microfilms Order No. 7922272

The band structure effects of He-LiF in bound state resonances were studied. Splittings of the ground state and first excited state by the (0,1) and (1,1) Fourier components of the potential were investigated and matrix elements of V sub 01 and V sub 11 were determined. The ability of various pairwise sums to fit the He-graphite experimental data was tested and an accurate model of the potential determined. It was found necessary to take into account the anisotropy of the He-C pair interaction. The band structure of He adsorbed on graphite was calculated, yielding a test of the nearly free particle of the resonant state used to derive the eigenvalues and matrix elements from the experimental data and the corrections to the energy near the ground state for comparison with results derived from measurements of thermodynamic properties of He films adsorbed on graphite.
Dissert. Abstr.

N80-10926 Rensselaer Polytechnic Inst., Troy, N. Y.
AN EXPERIMENTAL INVESTIGATION OF ANGULAR EFFECTS ON THE MOSSBAUER LINEBREADTH AND TIME DOMAIN ANALYSIS OF MOSSBAUER LINE BROADENING Ph.D. Thesis
John Walter Pettit 1979 155 p
Avail: Univ. Microfilms Order No. 7922236

Alternate techniques for the study of Mossbauer linebreadths are presented. The basis of expanding the range of Mossbauer spectroscopy to nuclear isomers with lifetimes greater than approximately ten microseconds through the incorporation of proposed linenarrowing techniques is developed. A short survey of proposed linenarrowing techniques is given along with a review of potential alternate principles for linebreadth measurement and a review of linebroadening mechanisms. The basis for the selection of time domain Mossbauer spectroscopy as a viable means of linebreadth measurement and the appearance of a measured angular correlation in the Mossbauer Linebreadth was investigated.
Dissert. Abstr.

N80-10927 California Univ., San Diego.
MAGNETIC AND SUPERCONDUCTING TRANSITIONS IN THE RARE EARTH RHODIUM BORIDE COMPOUNDS Ph.D. Thesis
Harry Bruce MacKay 1979 105 p
Avail: Univ. Microfilms Order No. 7921483

The superconducting and magnetic transition temperatures of the series of rare earth rhodium boride compounds are examined. Exchange scattering of conduction electrons by the RE magnetic moments in this system with an exchange coupling parameter is discussed. The nature of the superconducting to normal state transition at T sub c2 of the ferromagnetic superconductor ErRH4B4 was studied by heat capacity and ac magnetic susceptibility measurements with increasing and decreasing temperature. Thermal hysteresis, latent heat, and superheating effects that identify this transition as first order and distinguishable from the magnetic transition are examined.
Dissert. Abstr.

N80-10928 Rochester Univ., N. Y.
STUDY OF INTERNAL FRICTION IN SINGLE CRYSTAL SILICON Ph.D. Thesis
Clive Chemo Lam 1979 126 p
Avail: Univ. Microfilms Order No. 7922943

A technique to study internal friction and the internal properties of silicon crystals is discussed. The Akhieser mechanism and two Arrhenius type Debye relaxation peaks associated with oxygen are examined.
Dissert. Abstr.

N80-10929 Colorado State Univ., Fort Collins.
MEASUREMENTS OF THERMAL CONDUCTIVITY OF bcc He-3 AT VERY LOW TEMPERATURES Ph.D. Thesis
Gregory James Armstrong 1979 222 p
Avail: Univ. Microfilms Order No. 7923342

The thermal conductivity of bcc He-3, measured in samples grown at constant volume using the blocked capillary technique was studied. Molar volumes between 24.4 cc/mole and 22.4 cc/mole were investigated to temperatures in the vicinity of 30 mK using a dilution refrigerator. The thermal conductivity, with temperature near T to the 3 power in the low temperature limit, is discussed in relation to diffuse phonon scattering from crystal boundaries in a Debye solid.
Dissert. Abstr.

N80-10930 Northeastern Univ., Boston, Mass.
MAGNETIC FIELD STUDIES OF ELECTRONIC RAMAN

SCATTERING IN RARE-EARTH ZIRCONS Ph.D. Thesis
Donato Cardarelli 1979 228 p
Avail: Univ. Microfilms Order No. 7923531

The influence of an external field on the electronic energy states, which are responsible for driving the transition in these systems, was investigated using Raman scattering. The energies of the electronic modes were used to infer the splitting of these states as a function of magnetic fields at T > T sub D and T < T sub D The results were then compared with available theoretical predictions. For a magnetic field at 45 deg to the easy axis, the splitting in the electronic levels is mainly due to a Zeeman interaction. Dissert. Abstr.

N80-10931 Wisconsin Univ. - Milwaukee.
INTERACTION OF SURFACE WAVES WITH THIN NICKEL FILMS Ph.D. Thesis
I-an Feng 1979 172 p
Avail: Univ. Microfilms Order No. 7923446

Measurements of the surface wave attenuation of surface wave delay lines coated with a nickel film in a magnetic field parallel to the film plane in the frequency range 500 to 665 MHz exhibited attenuation peaks which depended strongly on film thickness, temperature and magnetic field. The effect was very strong for 200 A thick nickel film coated 618 MHz quartz delay lines at room temperature. The maximum attenuation was about 40 db/cm. The only LiNbO3 substrate covered with a 200 A nickel film that was measured exhibited a maximum attenuation of about 10 db/cm and similar behavior in a magnetic field. A 1000 A film and a 500 A film exhibited similar but much smaller attenuation peaks at 2200 Oe and 625 Oe respectively. Attenuation measurements were carried out over the temperature range 4-350 K, for the 500 A film. In general, the maximum attenuation decreased at lower temperatures and peaks occurred at higher field values. Dissert. Abstr.

N80-10932 California Inst. of Tech., Pasadena.
AN ATTEMPT TO PRODUCE BOTH THICK AND THINNED FLOWING SUPERFLUID FILMS. 1: A STUDY OF THE FEASIBILITY OF VERIFYING LIFSHITZ'S THEORY OF VAN DER WAALS FORCE FOR A METALLIC SURFACE. 2: THE ELECTROHYDRODYNAMIC INSTABILITY OF THE SUPER-THICK HELIUM FILM Ph.D. Thesis
Daniel Sai Wah Kwoh 1979 105 p
Avail: Univ. Microfilms Order No. 7922050

The thickness of a flowing helium film is investigated. The feasibility of verifying Lifshitz's theory of Van der Waals force by measuring the helium film thickness on a nickel surface from a height of about 1.5 mm to 0 mm is evaluated. The existence of instability of the helium film under a strong electric field is examined. Dissert. Abstr.

N80-10933 Washington State Univ., Pullman.
STUDIES OF CHEMICAL AND MECHANICAL SURFACE PHENOMENA BY PARTICLE EMISSION TECHNIQUES Ph.D. Thesis
Lawrence Albert Larson 1979 79 p
Avail: Univ. Microfilms Order No. 7923491

Three independent surface phenomena were studied by particle emission techniques. These techniques included thermal flash desorption, thermally stimulated exoemission, and tribostimulated exoemission. The dependence of neutral or charged particle emission on the thermal or mechanical stimulation is examined. The decomposition of formic acid on a clean Ru(10(-1)0) surface for adsorption temperatures between 100 K and 460 K by means of thermal flash desorption is described. The emission of neutral particles during tensile deformation of anodized aluminum alloys is discussed. The surface composition of NaCl after electron bombardment and color center decomposition was studied by the thermally stimulated emission of charged and neutral particles, and Auger electron spectroscopy. Dissert. Abstr.

N80-10934# Honeywell Electro-Optics Center, Lexington, Mass.
MINORITY CARRIER LIFETIME AND DIFFUSION LENGTH IN P-TYPE MERCURY CADMIUM TELLURIDE Final Report, Aug. 1977 - Jan. 1979
Joseph L. Schmit, Stephen P. Tobin, and Timothy J. Tredwell Feb. 1979 153 p refs
(Contract F33615-77-C-5142; AF Proj. 2423)
(AD-A071094; AFML-TR-79-4036) Avail: NTIS HC A08/MF A01 CSCL 20/12

This report covers a study of the relationship between minority carrier properties and majority carrier hole and acceptor concentrations. This report documents the following conclusions: The dominant recombination mechanism is Shockley-Read not radiative. The recombination center is at 140 meV above the valence band edge and has a concentration proportional to the acceptor concentration. GRA

N80-10935# Army Electronics Research and Development Command, Fort Belvoir, Va. Night Vision and Electro-Optics Labs.
PHYSICS OF MESOMORPHIC COMPOUNDS Final Report, May 1963 - Jun. 1971
Arlin J. Brown and Reinhard D. Ennulat Sep. 1978 125 p refs
(DA Proj. 1T1-61102-A-31B)
(AD-A070539; DELNV-TR-0003) Avail: NTIS HC A06/MF A01 CSCL 07/4

This final report summarizes the physical behavior of over 200 cholesteric liquid crystals including transition temperatures, heats of transition, temperature sensitivity of visible selective reflection spectra, the effect of impurities, combining liquid crystals, and behavior in a thermal-imaging system. Eleven homologous series of alkanoates omega phenylalkanoates, alkyl carbonates, and S-alkyl thiocarbonates of cholesterol, cholest-5-en-3 Beta-thiol, and 5 alpha-cholestan-3 Beta-o1 were investigated. Twenty liquid crystals were found to have a cholesteric color spectral range of 0.2 C or less. GRA

N80-10936# Saint Louis Univ., Mo. Dept. of Electrical Engineering.
AN ac LARGE SIGNAL MODEL FOR THE GaAs MESFET Final Report, 1 Jan. 1978 - 31 Jul. 1979
Asher Madjar and Fred J. Rosenbaum Aug. 1979 217 p refs
(Contract N00014-78-C-0256; RR02103046)
(AD-A071663) Avail: NTIS HC A10/MF A01 CSCL 20/12

An ac large signal model for the GaAs FET is presented. It incorporates the device geometry and semiconductor properties and relates the terminal currents to the instantaneous applied voltages and their time derivatives. The model is efficient and fast when implemented on a digital computer. Its form is suitable for large signal component design and optimization. A power amplifier and an oscillator are analyzed to demonstrate the use of the model. GRA

N80-10937# Cornell Univ., Ithaca, N. Y. School of Electrical Engineering.
RECTIFICATION AT N-N GaAs: (Ga, Al)As HETEROJUNCTIONS
Amitabh Chandra and Lester F. Eastman 22 Jun. 1979 12 p refs
(Contract N00014-75-C-0739)
(AD-A071732) Avail: NTIS HC A02/MF A01 CSCL 20/12

N-N Ga (.7)Al(.3)As: GaAs heterojunction structures have been grown by LPE, with 10 to the 15th power per cu cm net carriers in the ternary. N-W profiling across the heterojunction shows an accumulation region on the GaAs side and a depletion region on the (Ga, Al)As side. I-V characteristics at room temperature show significant rectification. GRA

N80-10938# Cornell Univ., Ithaca, N. Y. School of Electrical Engineering.
RECTIFICATION AT NGaAs - N Ga.7Al.3As HETEROJUNCTIONS GROWN BY LPE
Amitabh Chandra and Lester F. Eastman 22 Jun. 1979 21 p refs
(Contract N00014-75-C-0739)
(AD-A071733) Avail: NTIS HC A02/MF A01 CSCL 20/12

Heterojunctions between n-type GaAs, and high purity n-type Ga.7Al.3As have been grown by LPE at 700 C, and significant current rectification has been observed across them at room temperature. At low temperatures, the current drops and the degree of rectification increases considerably. The reverse current characteristic shows reasonable semi-quantitative agreement with theoretical I-V curves, calculated by using a thermionic emission

model. The N-W profile measured across the interface indicates qualitatively the presence of a dipolar space-charge region, as expected. GRA

N80-10939# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
ELECTRONIC CHARACTERISTICS OF 3 - 5 COMPOUNDS Final Report, 1 Jan. 1977 - 30 Sep. 1978
Harry C. Gatos May 1979 76 p refs
(Contract F19628-77-C-0060; AF Proj. 2306)
(AD-A071447; RADC-TR-79-95) Avail: NTIS HC A05/MF A01 CSCL 20/12

Our experimental and theoretical program has been aimed at the development of approaches and methods for the reliable electronic characterization of III-V compounds. We have investigated the determination of compositional, structural and electronic characteristics of GaAs and InP on a macro- and micro-scale. We have developed novel theoretical and experimental techniques for obtaining two-dimensional microprofiles of the carrier concentration in GaAs and InP (scanning IR absorption) and microprofiles of the minority carrier characteristics (SEM-EBIC mode). We have also developed convenient methods for the determination of the compensation ratio and total concentration of ionized impurities which is based on electron mobility and free carrier absorption. Finally, we have initiated a comprehensive characterization study of InP in conjunction with crystal growth. GRA

N80-10940# Illinois Univ., Urbana.
GROWTH OF BISMUTH TUNGSTATE SINGLE CRYSTALS
A. G. DeLaprevier 1979 7 p Presented at the Intern. Symp. on Ceramics in Nucl. Waste Management, Cincinnati, Ohio, 30 Apr. 1979
(Contract EY-76-C-02-1198)
(COO-1198-1261; Conf-790420-11) Avail: NTIS HC A02/MF A01

Hydrothermal and flux growth of Bi2W06 is described. Single crystals of Bi2W06 are examined and a complete characterization of the compound is presented. A.W.H.

N80-10941# Brookhaven National Lab., Upton, N. Y. Dept. of Chemistry.
DEPENDENCE OF CONDUCTION BAND ENERGY AND ELECTRON MOBILITY ON FLUID DENSITY
R. A. Holroyd and Ned E. Cipollini 1979 8 p refs Presented at the Intern. Congress Symp. on Radiation Res. and Stem Cells, Tokyo, 13 May 1979
(Contract EY-76-C-02-0016)
(BNL-26072; Conf-790524-2) Avail: NTIS HC A02/MF A01

Measurements of electron mobility and conduction band energy are reported as a function of density for neopentane and tetramethylsilane. Electron mobilities are for the gas phase at a temperature just above the critical temperature and for densities between 0.1 and 3.0 x 10 to the 21st power molecules/cc. The band energies (V sub 0) are for the gas phase over the same density range and temperature as well as for the liquid from 25 deg to the critical temperature. These data permit a comparison between V sub 0 and electron mobility over the entire density range. At low densities V sub 0 from work function shifts is given by (sq h/2 pi m)N alpha where the parameter alpha can be evaluated from mobility data. At an intermediate density there is a transition and V sub 0 changes abruptly to more negative values; in this transition region the mobility is minimum. Throughout the intermediate and high density range V sub 0 remains negative and changes only very slowly. DOE

N80-10942# California Univ., Livermore. Lawrence Livermore Lab.
MAGNETIC ORDER IN GOLD-IRON ALLOYS
R. J. Borg 22 Dec. 1978 33 p refs
(Contract W-7405-eng-48)
(UCRL-52636) Avail: NTIS HC A03/MF A01

The magnetic behavior of the Au-Fe alloy system was investigated. Moessbauer spectroscopy results demonstrate the existence of magnetic order and define three regions of alloy composition which exhibit the Kondo effect, spin glass behavior, and dependence on short-range order. Polarization and magnetization measurements also provide clues to magnetic behavior. DOE

N80-10943# Connecticut Univ., Storrs. Inst. of Materials Science.
ELECTRON-DISLOCATION INTERACTION AT LOW TEMPERATURES Progress Report
1978 57 p refs
(Contract EY-76-S-02-2305)
(COO-2305-6) Avail: NTIS HC A04/MF A01

Dislocations in aluminum are slowed down by magnetic fields, with the drag varying as H sup 2 and the drag is independent of temperature. The flux motion, in the mixed state of superconductors can be used to measure the mobile dislocation density over a wide range of strains and stresses. These results show, for the first time how to measure the mobile dislocation density in a tensile test. DOE

N80-10944# Universidade Estadual de Campinas (Brazil).
EFFECTS OF STOICHIOMETRY AND NEUTRON IRRADIATION IN SUPERCONDUCTING A-15 COMPOUNDS Ph.D. Thesis
S. Moehlecke 1978 232 p refs Prepared in cooperation with Brookhaven National Lab.
(Contract EY-76-C-02-0016)
(BNL-25940) Avail: NTIS HC A11/MF A01

The effects of varying stoichiometry, heat treatment, and irradiation with high energy neutrons on the superconducting transition temperature, Bragg-William order parameter, and the lattice parameter studied. The systems were Nb3Ge, Nb3Al, Nb3Pt, Nb3Ir, V3Ga, V3Si and Mo3Os. Results are analyzed. A simple hard sphere model is developed to calculate the dependence of on composition within the A-15 phase. Excellent agreement is obtained for the measured values in the Nb-Al, Nb-Pt and V-Ga systems. The results of both compositionally and irradiation induced disorder can be understood on the basis of site-exchange taking place between the A and B sites in the A-15 structure. DOE

N80-10945# Oak Ridge National Lab., Tenn.
STRUCTURE SOLUTION METHODS FOR SUPERSTRUCTURES
Carroll K. Johnson 1979 7 p refs Presented to the US-Japan Seminar on Long-Range in Ordering Crystals, Honolulu, Haw. 18 Mar. 1979
(Contract W-7405-eng-26)
(CONF-790342-1) Avail: NTIS HC A02/MF A01

Mechanistic perturbation techniques and conventional crystallographic techniques, suitably modified, are both applicable in crystal structure analysis of superstructures and modulated structures. It is strongly recommended that conventional crystallographic techniques be used whenever possible because of the greater opportunity to recognize unexpected physical results not built into the trial model. DOE

N80-10946# National Standard Reference Data System.
PHYSICAL PROPERTIES DATA COMPILATIONS RELEVANT TO ENERGY STORAGE. 3: ENGINEERING PROPERTIES OF SINGLE AND POLYCRYSTALLINE SODIUM BETA AND BETA-ALUMINA
G. R. Miller and D. G. Paquette Jun. 1979 22 p refs Prepared by Utah Univ., Salt Lake City
(PB-297847/6; NSRDS-NBS-61-Pt-3; LC-77-10824)
Copyright. Avail: Issuing Activity CSCL 20L

A review of the properties of the two dimensional supersonic conductors of the sodium beta alumina family is presented, with emphasis on the variability of properties with composition and processing. Processing methods, including methods of distributing additives, may strongly influence engineering properties of these substances through changes in microstructures. Described are common methods of measurement of properties with generally accepted ranges of property values. The need to compromise in the design of devices requiring several coincident optimal properties is, at this time, a necessary ingredient in the use of these materials as device components. GRA

N80-10947# National Technical Information Service, Springfield, Va.

LIQUID CRYSTALS, VOLUME 1. A BIBLIOGRAPHY WITH ABSTRACTS Report, 1964 - 1975
Diane M. Cavagnaro Aug. 1979 219 p
(NTIS/PS-79/0795/9) Avail: NTIS HC $28.00/MF $28.00 CSCL 20F

The bibliography cites studies on optical properties, phase transformations, chemical and physical properties, molecular synthesis, and testing of liquid crystals. The use of liquid crystals in display systems, fiber optics, memory devices, and test equipment is discussed. The bibliography contains 215 abstracts and no new entries to the previous edition are included. GRA

N80-10948# National Technical Information Service, Springfield, Va.
LIQUID CRYSTALS, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Report, 1976 - Jul. 1979
Diane M. Cavagnaro Aug. 1979 97 p Supersedes NTIS/PS-78/0767; NTIS/PS-77/0744; NTIS/PS-76/0681; NTIS/PS-75/591; NTIS/PS-74/116
(NTIS/PS-79/0796/7; NTIS/PS-78/0767; NTIS/PS-77/0744; NTIS/PS-76/0681; NTIS/PS-75/591; NTIS/PS-74/116) Avail: NTIS HC $28.00/MF $28.00 CSCL 20F

Research studies on optical properties, phase transformations, chemical and physical properties, molecular structure, synthesis, and testing of liquid crystals are cited. The compilation includes the use of liquid crystals in display systems, fiber optics, memory devices, and test equipment. The updated bibliography contains 91 abstracts, 17 of which are new entries to the previous edition. GRA

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N80-10949# Texas Univ., Austin. Center for Particle Theory.
QUANTUM ELECTRODYNAMICS AND LIGHT RAYS
E. C. G. Sudarshan Nov. 1978 13 p refs
(Contract EY-76-S-05-3992)
(ORO-3992-354) Avail: NTIS HC A02/MF A01

Light is a quantum electrodynamic entry and hence bundles of rays must be describable in this framework. The duality in the description of elementary optical phenomena is demonstrated in terms of two-point correlation functions and in terms of collections of light rays. The generalizations necessary to deal with two-slit interference and diffraction by a rectangular slit are worked out and the usefulness of the notion of rays of darkness is illustrated. DOE

N80-10950# Oak Ridge National Lab., Tenn. Environmental Sciences Div.
TIME SERIES ANALYSIS BY THE MAXIMUM ENTROPY METHOD
B. L. Kirk, B. W. Rust (Computer Sciences Div., Union Carbide), and W. VanWinkle Jan. 1979 222 p refs
(Contract W-7405-eng-26)
(ORNL-5332; ESD-Publ-1220) Avail: NTIS HC A10/MF A01

The classical Fourier method is discussed as a standard for comparison with the maximum entropy method. Examples are given which clearly demonstrate the superiority of the latter method over the former when the time series is short. Topics covered include the theory of the method, the effects of noise in the data, significance tests, the problem of choosing the prediction filter length, and, a package of FORTRAN subroutines for making the various calculations. Cross-referenced program listings are given in the appendices. The use of the programs is demonstrated. Real time series like the lynx data and sunspot numbers are also analyzed. DOE

N80-10951# Los Alamos Scientific Lab., N. Mex. Theoretical Div.
ANALYTIC COHERENT STATES FOR GENERALIZED POTENTIALS
Michael Martin Nieto and L. M. Simmons, Jr. 1978 29 p refs Presented at Symp. on the Foundation of Radiation Theory Quantum Electrodynamics, Boulder, Colo., 28 Apr. 1978
(Contract W-7405-eng-36)
(LA-UR-79-218; Conf-7804122-1) Avail: NTIS HC A03/MF A01

A prescription is given for finding coherent states in generalized potentials. The prescription is based upon finding those natural classical variables which vary as the sine and the cosine of the classical omega/sub c/t. As an example, the symmetric Rosen-Morse potential is discussed in detail. DOE

N80-10952# Hawaii Univ., Honolulu. Dept. of Physics and Astronomy.
ASYMPTOTIC FREEDOM WITHOUT GUILT
Ernest Ma Jan. 1979 9 p refs
(Contract EY-76-C-03-0511)
(UH-511-329-79) Avail: NTIS HC A02/MF A01

The notion of asymptotic freedom in quantum chromodynamics is explained on general physical grounds, without invoking the formal arguments of renormalizable quantum field theory. The related concept of quark confinement is also discussed along the same line. DOE

N80-10953# Argonne National Lab., Ill.
THERMAL CONDUCTIVITY OF THE HELIUM-ARGON SYSTEM
A. Purohit and J. R. Moszynski (Univ. of Delaware) Feb. 1979 19 p refs
(Contract W-31-109-eng-38)
(ANL-79-3) Avail: NTIS HC A02/MF A01

A semiempirical relation for the thermal conductivity of helium-argon gas mixtures is described. Thermal conductivity data for helium, argon, and helium-argon mixtures is presented and an approach to predict thermal conductivities of helium-argon mixtures to within 5% of their true values for temperatures up to 1200 K is discussed. DOE

N80-10954# Argonne National Lab., Ill.
ELECTRONIC SPECIFIC HEATS IN METAL-HYDROGEN SYSTEMS
Howard E. Flotow 1979 34 p refs Presented at the Intern. Meeting Hydrogen in Metals, Munster, West Germany, 6-9 Mar. 1979
(Contract W-31-109-eng-38)
(CONF-790301-11) Avail: NTIS HC A03/MF A01

The electronic specific heats of metals and metal-hydrogen systems are evaluated from the measured specific heats at constant pressure. A low temperature calorimetric cryostat employing a He-3/He-4 dilution refrigeration is described. Various considerations and complications encountered in the evaluation of gamma from specific heat data are discussed. The experimental values of gamma for the V-Cr-H system and for the Lu-H system are summarized and the variations of gamma as a function of alloy composition are examined. DOE

N80-10955# Oak Ridge National Lab., Tenn.
THERMODYNAMICS OF PRECIPITATION SYSTEMS
R. O. Williams Jun. 1979 23 p refs
(Contract W-7405-eng-48)
(ORNL-5537) Avail: NTIS HC A02/MF A01

The particular combination of features that are required for a binary system to show useful precipitation hardening is examined. The thermodynamics of useful systems and the supplementary conditions necessary for a useful precipitation system are investigated. The potential for the development of new alloys containing three or more compounds is discussed. A.W.H.

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

No abstracts in this category.

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N80-10956*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NSSDC DATA LISTING
Aug. 1979 51 p
(NASA-TM-80349; NSSDC/WDC-A-R&S-79-05) Avail: NTIS HC A04/MF A01 CSCL 05B

Data available from the National Space Science Data Center (NSSDC) are listed. The spacecraft, principal investigator, the experiment, and time span of the data are given. A listing is also included of ground-based data, models, computer routines and composite spacecraft data that are available from NSSDC. F.O.S.

N80-10957# System Development Corp., Santa Monica, Calif.
DEDUCTIVE PLANNING AND PATHFINDING FOR RELATIONAL DATA BASES
Charles Kellogg, Philip Klahr, and Larry Travis (Wisconsin Univ., Madison) 1978 22 p refs
(Contract N00014-76-C-0885)
(AD-A070801) Avail: NTIS HC A02/MF A01 CSCL 05/2

Inference planning techniques have been implemented and incorporated within a prototype deductive processor designed to support the extraction of information implied by, but not explicitly included in, the contents of a relationally structured data base. Deductive pathfinding and inference planning are used to select small sets of relevant premises and to construct skeletal derivations. When these skeletons are verified, the system uses them as plans to create data-base access strategies that guide the retrieval of data values, to assemble answers to user requests, and to produce proofs supporting those answers. Several examples are presented to illustrate the current capability of the prototype Deductively Augmented Data Management (DADM) system. GRA

N80-10958# Army Research Inst. for the Behavioral and Social Sciences, Arlington, Va.
EFFECTS OF RETRIEVAL TERM SPECIFICALLY ON INFORMATION RETRIEVAL FROM COMPUTER-BASED INTELLIGENCE SYSTEMS
Lawrence M. Potash Jul. 1979 52 p refs
(AD-A072312; ARI-TP-379) Avail: NTIS HC A04/MF A01 CSCL 05/2

This experiment assessed the impact of using two levels of retrieval terms on formulating and inputting query statements. One level used specific terms to retrieve one element of information; the other level used global terms to retrieve blocks of information that would otherwise require five to six specific terms. Participants were then given a set of 48 problems. For each problem, the participants had to write and type a query statement that would satisfy the information requirements. The opportunity to use global terms had no effect either on the time needed to write query statements or on the accuracy of typed query statements. Where the use of global terms was applicable, substantial savings in the time required to input query statements was shown. Except that the global-specific group reported that it made more use of the data name chart before using the data dictionary, the two groups indicated that they went about writing query statements in approximately the same way. Both groups gave high ratings to the value of using global terms. Use of global terms is not recommended unless the specific items of information subsumed under the global term are normally retrieved together frequently. GRA

N80-10959# Sandia Labs., Albuquerque, N. Mex. Chemistry of Organic Materials Div.
SUMMARY OF THE SANDIA MATERIALS INFORMATION DATA BANK
K. E. Mead 1978 14 p Presented at DOE Compatibility Meeting, Golden, Colo., 17 Oct. 1978
(Contract EY-76-C-04-0789)
(SAND-78-1961C; Conf-781067-3) Avail: NTIS HC A02/MF A01

A data bank intended to provide quick retrieval of information regarding materials properties and reactions is described. The data bank consists of two major parts: a computerized index of materials and document descriptions and a microfiche file of all documents catalogued in the computer. Of particular interest is a record of materials aging and compatibility data. The computer program provided rapid interactive searching and is written so that the uninitiated can quickly learn to search. The data bank now references 420 documents and memoranda with information on 600 materials. DOE

N80-10960# Oak Ridge National Lab., Tenn. Computer Sciences Div.
ON THE DESIGN OF AN INTERACTIVE INFORMATION RETRIEVAL PROGRAM
G. K. Haeuslein 1978 16 p Presented at Conf. on Very Large Data Bases, Berlin, 13 Sep. 1978
(Contract W-7405-eng-26)
(CONF-780990-1) Avail: NTIS HC A02/MF A01

The Oak Ridge RECON program is described. This is an interactive program that searches bibliographical data bases. The data bases are collections of document descriptions along with the corresponding inverted files. Twenty data bases are now supported; some of these are very large, containing about 1/4 million abstracts, with each abstract on the average being 1300 characters long. The user operates in the system by means of a remote console. The logic and operation of the code are discussed. DOE

N80-10961# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
MANUAL OF DOCUMENTATION PRACTICES APPLICABLE TO DEFENCE-AEROSPACE SCIENTIFIC AND TECHNICAL INFORMATION, VOLUME 2
S. C. Schuler, ed. Jul. 1979 124 p refs
(AGARD-AG-235-Vol-2) Avail: NTIS HC A06/MF A01

An introduction to the hardware and software of computer systems is given, followed by a description of the problems of the input of data, including the representation of characters and the choice of a character set. The different types of input and storage equipment are described and examples are given. Management and systems analysis problems are outlined in the project environment. Finally, there is a brief introduction to chemical structure input and storage techniques. Author

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N80-10962*# ECON, Inc., Princeton, N. J.
A STUDY OF THE COST-EFFECTIVE MARKETS FOR NEW

TECHNOLOGY AGRICULTURAL AIRCRAFT
George A. Hazelrigg, Jr. and Fred Clyne Sep. 1979 161 p
(Contract NASw-2781)
(NASA-CR-159090) Avail: NTIS HC A08/MF A01 CSCL 05C

A previously developed data base was used to estimate the regional and total U.S. cost-effective markets for a new technology agricultural aircraft as incorporating features which could result from NASA-sponsored aerial applications research. The results show that the long-term market penetration of a new technology aircraft would be near 3,000 aircraft. This market penetration would be attained in approximately 20 years. Annual sales would be about 200 aircraft after 5 to 6 years of introduction. The net present value of cost savings benefit which this aircraft would yield (measured on an infinite horizon basis) would be about $35 million counted at a 10 percent discount rate and $120 million at a 5 percent discount rate. At both discount rates the present value of cost savings exceeds the present value of research and development (R&D) costs estimated for the development of the technology base needed for the proposed aircraft. These results are quite conservative as they have been derived neglecting future growth in the agricultural aviation industry, which has been averaging about 12 percent per year over the past several years. A.R.H.

N80-10963# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
SENSITIVITY ANALYSIS OF OPTIMAL LINEAR RANDOM PARAMETER SYSTEMS M.S. Thesis
Prashant Parikh May 1979 140 p refs
(Grant AF-AFOSR-3321-77; NSF SOC-76-05837)
(AD-A071091; LIDS-TH-911; AFOSR-79-0753TR) Avail: NTIS HC A07/MF A01 CSCL 05/3

This report involves the application of ideas in adaptive stochastic control to economics. We investigate the control problem for a linear, multivariable, dynamic system with purely random (i.e. white) parameters. The quadratic cost criterion is formulated to make the problem a tracking problem. Since the parameters are modelled as white stochastic processes, there is no posterior learning and no dual effect. The certainty-equivalence principle does not hold. We find that the extension of the Uncertainty Threshold Principle from scalar systems to multidimensional ones turns out to be analytically intractable. Next, we derive sensitivity equations for the above optimal system to study the effects of small variations in parameter uncertainties on the optimal performance of the system. These equations enable us to rank parameters in order of the sensitivity of the performance to variations in their variances. This makes it possible to locate the 'pressure' points in a model, if any exist. We then convert an economic policy problem into a stochastic optimal control tracking problem and analyze it with the equations we have derived. We study the different elements that enter into a tracking problem and then discuss the empirical results obtained from the sensitivity equations. The model we choose for the analysis turns out to be insensitive to variations in parameter variances which makes it reasonably reliable. We also analyze in detail the structure of the model and the interdependences of the state and control variables. GRA

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N80-10964# Committee on Commerce, Science, and Transportation (U. S. Senate).
NASA AUTHORIZATION FOR FISCAL YEAR 1980. PART 4: INDEX
Washington GPO 1979 122 p Hearings on S. 357 before the Comm. on Commerce, Sci., and Transportation, 96th Congr., 1st Sess., 1979
(GPO-51-336) Avail: Comm. on Commerce, Sci., and Transportation

Indexes to appropiations for space research and development, construction of facilities, and research and program management. A.W.H.

N80-10965# Unified Industries, Inc., Alexandria, Va.
MANAGERIAL PLAN: EXECUTIVE ORDER 12003 AND THE NATIONAL ENERGY ACT
Dec. 1978 96 p
(Contract EM-77-C-01-8962)
(DOE/TIC-10067) Avail: NTIS HC A05/MF A01

A management tool is provided to assist in planning and developing the Federal Energy-Conservation Program which requires that, by 1985, Executive Branch agencies that own or will own buildings reduce building energy-consumption substantially below 1975 levels. The order also requires that all agencies of the Branch conduct programs designed to reduce energy consumption in general operations of the agency. The program master plan defines goals, objectives strategies, and milestones within a structure that describes the framework, elements, phases, and roles of the agencies. Data requirements for the planning, implementing, evaluating, and reporting functional requirements of the executive order are included with an analysis of the DOE organizational management and resource requirements. DOE

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see 03 Air Transportation and Safety, 16 Space Transportation, and 44 Energy Production and Conversion.

N80-10966 Pennsylvania State Univ., University Park.
THE APPLICATION OF AN ADDITIVE-ULTIMATE MODEL TO THE EVALUATION OF TRANSPORTATION SYSTEM MANAGEMENT STRATEGIES Ph.D. Thesis
Peter Morley Lima 1979 202 p
Avail: Univ. Microfilms Order No. 7922308

Transportation efficiency was investigated in terms of implementing transportation system management (TSM) strategies. Various TSM strategies were compared by testing the hypothesis that an additive-utilities model can be applied to evaluate alternative TSM strategies. The current transportation resource allocation process, cost effectiveness, and the feasibility of assessing an additive-utilities model by a random sampling of the metropolitan population were among the topics studied. It is concluded that the systems analytic method is an effective approach for constructing a TSM evaluation framework and that the expected utility theory is a valuable tool for specifying single attribute utility functions, and general equations based on this theory can be used to trace an individual's utility function. The additive-utilities model successfully distinguishes between different TSM packages and indicates like packages. Dissert. Abstr.

N80-10967*# National Aeronautics and Space Administration, Washington, D. C.
NASA TECH BRIEFS INDEX, 1978
1978 123 p
(NASA-SP-5021(20)) Avail: NTIS HC A06/MF A01 CSCL 05A

Approximately 601 announcements of new technology derived from the research and development activities of the National Aeronautics and Space Administration are presented. Emphasis is placed on information considered likely to be transferrable across industrial, regional, or disciplinary lines. Subject matter covered includes: electronic components and circuits; electron systems; physical sciences; materials; life sciences; mechanics; machinery; fabrication technology; and mathematics and information sciences. A.W.H.

N80-10968*# National Aeronautics and Space Administration, Washington, D. C.
NASA TECH BRIEFS INDEX, 1977, VOLUME 2,

NUMBERS 1-4
1977 99 p
(NASA-SP-5021(19)) Avail: NTIS HC A06/MF A01 CSCL 05A

Announcements of new technology derived from the research and development activities of NASA are presented. Abstracts, and indexes for subject, personal author, originating center, and Tech Brief number are presented for 1977. F.O.S.

N80-10969*# National Aeronautics and Space Administration, Washington, D. C.
CUMULATIVE INDEX TO NASA TECH BRIEFS, 1970-1975
1979 767 p refs
(NASA-SP-5021(18)) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 05A

Tech briefs of technology derived from the research and development activities of the National Aeronautics and Space Administration are presented. Abstracts and indexes of subject, personal author, originating center, and tech brief number for the 1970-1975 tech briefs are presented. A.W.H.

N80-10970# California Univ., Livermore. Lawrence Livermore Lab.
ENERGY STORAGE SYSTEMS FOR AUTOMOBILE PROPULSION, 1978 STUDY. 1: OVERVIEW AND FINDINGS
C. J. Berhrim, C. J. Anderson, H. Bomelburg (Battelle Pacific Northwest Labs.), M. Farahat (Argonne National Lab.), H. C. Forsberg, C. L. Hudson (Interplan Corp.), B. C. Kullman (Cambridge Systematics, Inc., Mass.), L. G. OConnell, G. Strickland (Brookhaven National Lab.), and W. J. Walsh 15 Dec. 1978 57 p refs
(Contract W-7405-eng-48)
(UCRL-52553-Vol-1) Avail: NTIS HC A04/MF A01

Technical and cost analyses were made of electrochemical, mechanical, chemical, and thermal storage devices and power systems which are likely to provide credible alternatives to current and future internal combustion engine propulsion systems between now and the year 2000. These devices were used in conceptual designs of various energy storage propulsion systems. Their resultant performances and costs were calculated and compared against each other and against a baseline ICE vehicle system conceptually designed to provide the same performance. Aspects of concern were the effect on all-battery electric systems of optimizing batteries for the specific peak power and specific energy relationship, the effect on the relative results of using highly optimistic (10% confidence level) component characteristics; the national energy impact of the future introduction of energy storage automobiles; and the effect on prior results and conclusions of R and D achievements in the past year. DOE

N80-10971# Sandia Labs., Albuquerque, N. Mex.
SANDIA IRRADIATOR FOR DRIED SEWAGE SOLIDS
Feb. 1979 192 p refs Seminar held at Albuquerque, N. Mex., 18-19 Oct. 1978
(Contract EY-76-C-04-0789)
(SAND-79-0182; Conf-7810165) Avail: NTIS HC A09/MF A01

The state-of-knowledge and state-of-the-art of gamma irradiation of dried sewage solids are reviewed in 13 papers presented at a seminar organized in conjunction with the formal dedication of a facility for this purpose. Topics covered include: (1) the DOE interest and participation in the program; (2) the EPA responsibility for sludge management; (3) the encouragement given by the Congress in various public laws for the beneficial utilization of sludges by means of land application; (4) the pathogen hazards of such use; (5) pathogen reduction with gamma irradiation from isotope sources; (6) Nuclear Regulatory Commission licensing and regulation requirements for the safety of isotope usage; (7) other utilization constraints; public health, institutional, and legal considerations; (8) the beneficial utilization of the treated raw product in agronomics, animal refeeding and over-the-counter sales of composted products; (9) the facilities for irradiation of these sludge products to ensure adequate pathogen reduction; (10) formulation of the design criteria and the construction of an eight-ton/day, one-megarad dose pilot plant; (11) the pre-A&E design package, supporting software, and licensing checklist prepared for a larger (25 ton/day) demonstration plant; and (12) similar European activities which look at isotope source quantities and sludge utilization and their cost-benefit implications. A.R.H.

N80-10972# British Petroleum Oil, Inc., Marcus Hook, Pa.
TREATMENT OF REFINERY WASTEWATER USING A FILTRATION-ACTIVATED CARBON SYSTEM Final Report, Oct. 1973 - Jun. 1978
Bruce A. McCrodden Mar. 1979 91 p
(Grant EPA-12050-GXF)
(PB-295780/1; EPA-600/2-79-066) Avail: NTIS HC A05/MF A01 CSCL 13B

The applicability of a dual media filtration-activated carbon adsorption system for the treatment of petroleum refinery waste water is assessed. The capital cost of the waste water treatment plant was $1,812,000 with an annual operating cost of $223,980. GRA

N80-10973# Clean Water Fund, Washington, D. C.
CRITICAL RESEARCH NEEDS IN COMMUNITY WATER MANAGEMENT
25 Jul. 1978 57 p refs
(PB-295984/9; NSF/RA-780563) Avail: NTIS HC A04/MF A01 CSCL 13B

Research needs were identified as critical when they could, if filled, make for significant near-term improvements in efforts to solve some of the most important water problems. Needs which appeared as obstacles to solutions of more than one significant water problem were regarded as especially critical. The water problems examined include: (1) problems resulting from widespread use of conventional sewage treatment technologies and resistance to alternative methods; (2) water storages and the price of water; and (3) drinking water contamination. The sewage treatment program is considered the weakest link in the national effort to control concentrated pollution from point sources. GRA

N80-10974# Environmental Protection Agency, Kansas City, Mo.
MUNICIPAL WASTEWATER TREATMENT FACILITY, WINTER 1978
Steven P. Busch Feb. 1979 29 p
(PB-296813/9; EPA-907/9-79-002) Avail: NTIS HC A03/MF A01 CSCL 13B

Data collected at seventy waste water treatment facilities during the winter of 1978 are summarized and briefly evaluated. Types of treatment plants examined include the following: oxidation ditch, rotating biological surface, activated bio surface, uncovered trickling filter, covered trickling filter, activated sludge, and lagoon. GRA

N80-10975# National Bureau of Standards, Washington, D. C.
DIMENSIONS/NBS, VOLUME 63, NO. 6, JUNE 1979 Monthly Report
Jun. 1979 37 p
(PB-297836/9; NBS/DIM-63/6) Avail: NTIS HC A03/MF A01 CSCL 14B

Contents: Cities in Renaissance; Keeping Tabs on Toxicity; Wanted-Better Energy Ideas; NBS Publishes Updated Survey of State Solar Energy Legislation; Characterizing South Pole Aerosols with the Raman Microprobe; Conferences; Publications; News Briefs. GRA

N80-10976# Massachusetts Inst. of Tech., Cambridge.
HIGH ENERGY ELECTRON RADIATION OF WASTEWATER LIQUID RESIDUALS
28 Feb. 1979 74 p
(Grant NSF ENV-77-10199)
(PB-297593/6; NSF/RA-790074) Avail: NTIS HC A04/MF A01 CSCL 13B

The disinfection of municipal sludge by treatment with energized electrons is reported. Microbiological, operational, and economic information on the electron disinfection process is discussed. The degradation of trace toxic chemicals and gram negative bacteria including coliforms, salmonellae, and shigellae is examined. GRA

N80-10977# Utah Water Research Lab., Logan.
PERFORMANCE AND UPGRADING OF WASTEWATER STABILIZATION PONDS Final Report
E. Joe Middlebrooks, Donna H. Falkenborg, and Ronald Lewis May 1979 226 p refs Conf. held at Logan, Utah, 23-25 Aug. 1978
(Grant EPA-R-805842)
(PB-297504/3; EPA-600/9-79-011) Avail: NTIS HC A11/MF A01 CSCL 13B

The design, operation, performance, and upgrading of lagoon systems are discussed. Performance data for facultative and aerated lagoons are presented. Design criteria and the applicability of performance data to design equations are discussed. Rock filters, intermittent sand filters, microscreening and other physical chemical techniques, phase isolation, land application, and controlled environment aquaculture are evaluated. GRA

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N80-10978*# Steward Observatory, Tucson, Ariz.
NEAR INFRARED PHOTOGRAPHIC SKY SURVEY. 1: CATALOG OF RED STELLAR OBJECTS
E. R. Craine, R. E. Duerr, V. M. Horner, C. L. Imhoff, D. E. Routsis, D. L. Swihart, and D. A. Turnshek Aug. 1979 73 p refs Sponsored by NASA and NSF
(NASA-CR-162386; Contrib-Ser-A-3) Avail: NTIS HC A04/MF A01 CSCL 03A

Red stellar objects for which V-1 was greater than a value of about 2 (supm). 5 were extracted from photographs of 23 program fields. Tabular data for each field show the object name; the 1950 epoch right ascension, declination, galactic longitude, galactic latitude; radial distance from field venter in decimal degrees; color classes; and objects ordered by redness. A.R.H.

N80-10244*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
RADIO ASTRONOMY
R. J. Fahnestock and R. M. Taylor *In its* The Deep Space Network 15 Oct. 1979 p 21-23 refs (For primary document see N80-10240 01-12)
Avail: NTIS HC A09/MF A01 CSCL 03A

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N80-10979*# Cornell Univ., Ithaca, N. Y. Center for Radiophysics and Space Research.
STELLAR CONVECTION 2: A MULTI-MODE NUMERICAL SOLUTION FOR CONVECTION IN SPHERES
Philip S. Marcus Nov. 1979 63 p refs
(Grants NGR-33-010-186; NSF ATM-76-10424; NSF AST-78-20708)
(NASA-CR-162252; CRSR-731) Avail: NTIS HC A04/MF A01 CSCL 03B

The convective flow of a self gravitating sphere of Boussinesq fluid for small Reynolds and Peclet numbers is numerically determined. The decomposition of the equations of motion into modes is reviewed and a relaxation method is developed and presented to compute the solutions to these equations. The stable equilibrium flow for a Rayleigh number of 10 to the 4th power and a Prandtl number of 10 is determined. The 2 and 3 dimensional spectra of the kinetic and thermal energies and the convective flux as a function of wavelengths are calculated in terms of modes. The anisotropy of the flow as a function of wavelength is defined. A.W.H.

N80-10980*# Cornell Univ., Ithaca, N. Y. Center for Radiophysics and Space Research.
STELLAR CONVECTION 3: CONVECTION AT LARGE RAYLEIGH NUMBERS
Philip S. Marcus Nov. 1979 54 p refs
(Grants NGR-33-010-186; NSF ATM-76-10424; NSF AST-78-20708)
(NASA-CR-162253; CRSR-732) Avail: NTIS HC A04/MF A01 CSCL 03B

A three dimensional study of convection in a self gravitating sphere of Boussinesq fluid with a Rayleigh number of 10 to the 10th power and a Prandtl of 1 is presented. The velocity and temperature of the fluid are computed at the largest wavelengths using spectral methods. A confirmation that the fluid is anisotropic and that the energy spectra are not smooth functions of wavelength but have a large amount of fine structure is discussed. The parameterization of the transport properties of the unresolvable inertial subrange with eddy viscosities and diffusivities is described. The time dependent fluctuations in the energy spectra and how they cascade from large to small wavelengths is examined. A.W.H.

N80-10981*# National Aeronautics and Space Administration, Washington, D. C.
NON-EQUILIBRIUM PROCESSES IN INTERSTELLAR MOLECULES
V. S. Strelnitskiy Oct. 1979 27 p refs Transl. into ENGLISH of Neravnovesnye Protessy v Mezhzvezdnykh Molekulah (Moscow), Pr-462, 1979 30 p Transl. by Scientific Translation Service, Santa Barbara, Calif. Original document prepared by Academy of Sciences (USSR), Moscow
(Contract NASw-3198)
(NASA-TM-75695; Pr-462) Avail: NTIS HC A03/MF A01 CSCL 09B

The types of nonequilibrium emission and absorption by interstellar molecules are summarized. The observed brightness emission temperatures of compact OH and H2O sources are discussed using the concept of maser amplification. A single thermodynamic approach was used in which masers and anti-masers are considered as heat engines for the theoretical interpretation of the cosmic maser and anti-maser phenomena. The requirements for different models of pumping are formulated and a classification is suggested for the mechanisms of pumping, according to the source and discharge of energy. A.W.H.

N80-10982*# National Aeronautics and Space Administration, Washington, D. C.
PROPAGATION OF WAVES IN A MEDIUM WITH HIGH RADIATION PRESSURE
G. S. Bisnovatyy-Kogan and S. I. Blinnikov Oct. 1979 40 p refs Transl. into ENGLISH of Rasprostraneniye Voln v Srede s Vysokim Luchistym Davleniem (Moscow), Pr-421, 1978 45 p Original language document announced as A79-39378 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original document prepared by Academy of Sciences (USSR), Moscow
(Contract NASw-3198)
(NASA-TM-75679; Pr-421) Avail: NTIS HC A03/MF A01 CSCL 03B

The propagation and mutual transformation of acoustic and thermal waves are investigated in media with a high radiative pressure. The equations of hydrodynamics for matter and the radiative transfer equations in a moving medium in the Eddington approximation are used in the investigation. Model problems of waves in a homogeneous medium with an abrupt jump in opacity and in a medium of variable opacity are presented. The characteristic and the times of variability are discussed. Amplitude for the brightness fluctuations for very massive stars are discussed. A.W.H.

N80-10983*# National Aeronautics and Space Administration, Washington, D. C.

HYDRODYNAMICS OF PRIMORDIAL BLACK HOLE FORMATION

D. K. Nadezhin, I. D. Novikov, and A. G. Polnarev Oct. 1979 31 p refs Transl. into ENGLISH of "Gidrodinamika Obrazovaniya Pervichnikh Chyornykh dyr". Rept. Pr-347 Acad. of Sci. USSR, Inst. of Space Res., Moscow, 1979 p 1-36 Original language document was announced as A79-16307 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75918; Pr-347) Avail: NTIS HC A03/MF A01 CSCL 03B

The hydrodynamic picture of the formation of primordial black holes (PBH) at the early stages of expansion of the Universe is considered. It is assumed that close to singularity, expansion occurs in a quasi-isotropic way. Using an EVM, a spherically symmetrical nonlinear problem of the evolution of primary strong deviation from the Fridman solution was solved. What these deviations must be, so that the formation of PBH occurred was clarified. Attention was devoted to the role of pressure gradients. It is pointed out that at the moment of formation of PBH, only a small part of matter enters into it, primarily the component of perturbation. It is also pointed out that at this moment, the mass of PBH essentially is smaller than the mass considered within the cosmic horizon. The possibility of changing the mass of the PBH as a result of accretion is analyzed. F.O.S.

N80-10984*# Los Alamos Scientific Lab., N. Mex.
ION ACCELERATION AT THE EARTH'S BOW SHOCK: A REVIEW OF OBSERVATIONS IN THE UPSTREAM REGION

J. T. Gosling, J. R. Asbridge, S. J. Bame, and W. C. Feldman 1979 21 p refs Presented at Workshop on Particle Acceleration Mechanisms in Astrophysics, La Jolla, Calif., 3 Jan. 1979
(Contract W-7405-eng-36)
(LA-UR-79-309; Conf-790144-1) Avail: NTIS HC A02/MF A01

Positive ions and their acceleration at or near the earth's bow shock and their propagation into the upstream region are studied. Two distinctly different populations of these ions, distinguished by their greatly different spectral and angular widths, are identified. The type of ion population observed in the upstream region is correlated with the presence or absence of long period compressive waves in the solar wind. Whether the most energetic ions are accelerated at the shock or in broad disturbed region upstream from the shock is discussed. Stochastic acceleration by turbulent electrostatic field, the most viable candidate for the acceleration of the energetic particles is examined. DOE

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N80-10985 California Univ., Los Angeles.
LUNAR CRUSTAL MAGNETIC ANOMALIES DETECTED BY THE APOLLO SUBSATELLITE MAGNETOMETERS Ph.D. Thesis

Lonnie Lamar Hood 1979 183 p
Avail: Univ. Microfilms Order No. 7921416

Optimal magnetic anomaly mapping techniques using Apollo subsatellite magnetometer data were determined. These techniques were applied to extend the selenographic coverage of existing maps. Model fitting procedures for inferring bulk magnetization properties of major anomaly sources were developed. Numerical modeling of previously mapped large anomaly fields on the lunar far side were carried out using an iterative forward modeling procedure. The major anomaly source locations and limits on the bulk directions of magnetization of individual sources were determined. Dissert. Abstr.

N80-10986*# Planetary Science Inst., Pasadena, Calif.
LUNAR RADAR BACKSCATTER STUDIES Final Report, 15 Jul. - 14 Oct. 1978

Thomas W. Thompson 19 Oct. 1979 51 p refs
(Contract NASw-3205)
(NASA-CR-162415; Rept-5-420-71-780-09) Avail: NTIS HC A04/MF A01 CSCL 03B

The lunar surface material in the Plato area is characterized using Earth based visual, infrared, and radar signatures. Radar scattering in the lunar regolith with an existing optical scattering computer program is modeled. Mapping with 1 to 2 km resolution of the Moon using a 70 cm Arecibo radar is presented. A.W.H.

N80-10987# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
SATURN'S MAGNETOSPHERE, RINGS, AND INNER SATELLITES

J. A. Van Allen, M. F. Thomsen, B. A. Randall, R. L. Rairden, and C. L. Grosskreutz 2 Nov. 1979 30 p refs Submitted for publication
(Contract N00014-76-C-0016)
(U-of-Iowa-79-44) Avail: NTIS HC A03/MF A01

The discovery of the magnetosphere of Saturn and a survey of its characteristics is presented. Measurements of energetic charged particle distributions within the inner magnetosphere are discussed and new findings on the rings and inner satellites of the planet, provided by the measurements, are examined. A.W.H.

N80-10988*# National Aeronautics and Space Administration, Washington, D. C.
RESULTS AND INTERPRETATION OF MEASUREMENTS OF THE LIGHT FLUX IN THE NEAR-SURFACE LAYER OF THE VENUSIAN ATMOSPHERE

Yu. M. Golovin, B. Ye. Moshkin, and A. P. E. Ekonomov Oct. 1979 48 p refs Transl. into ENGLISH of Rezul'taty i interpretatsiya izmereniy svetovykh potokov v pripoverkhnostnom sloye atmosfery Venery (Moscow), Pr-338, 1977 40 p Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original document prepared by Academy of Sciences (USSR), Moscow
(Contract NASw-3199)
(NASA-TM-75716; Pr-338) Avail: NTIS HC A03/MF A01 CSCL 03B

The characteristics of the field of radiation in the near surface layer of the atmosphere and on the surface of Venus are reported. Optical measurements made during the landing of the descent vehicles are described. The relief of the surface and the amount of dust on it are examined. The spectral relationship of the albedo of the soil and the light flux incident on the surface is discussed. A.W.H.

N80-10989*# National Aeronautics and Space Administration, Washington, D. C.
ON THE STRUCTURE OF THE UPPER ATMOSPHERE OF MARS ACCORDING TO DATA FROM EXPERIMENTS ON THE VIKING SPACE VEHICLES

M. N. Izakov Oct. 1979 21 p refs Transl. into ENGLISH from O strukture verkhney atmosfery marsa po dannym eksperimentov na kosmicheskikh apparatakh Viking (Moscow), Pr-343, 1977 p 1-19 Original language document announced as A79-18856 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original document prepared by Academy of Sciences (USSR), Moscow
(Contract NASw-3198)
(NASA-TM-75717; Pr-343) Avail: NTIS HC A02/MF A01 CSCL 03B

Altitude profiles of the concentrations of the atmospheric components measured by the on board mass spectrometers during the descent of Viking lander are discussed by assuming that temperature has a smoother profile, and the eddy mixing coefficients are smaller at altitudes of 120 to 170 km than those formally determined. The influence of acoustic gravitational waves and errors in measurements and calculations are discussed in relation to the convolutions in the altitude profiles of the concentrations of the atmospheric components and the temperature of the atmosphere. A.W.H.

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N80-10990*# National Aeronautics and Space Administration, Washington, D. C.
NUMERICAL MODELING OF STIMULATION OF INDUCED MAGNETOSPHERE DURING INTERACTION OF SOLAR WIND WITH THE IONOSPHERE OF VENUS
A. S. Lipatov Oct. 1979 25 p refs Transl. into ENGLISH of "Chislennoye modelirovaniye vozbuzhdeniia indutsirovannoy magnitosfery pri pri vzaimodeystvii solnechnogo vetra s ionosferoy venery", Rept. Pr-351 USSR Academy of Sciences, Inst. of Cosmic Research, Moscow, 1977 p 1-24 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-75921; Pr-351) Avail: NTIS HC A02/MF A01 CSCL 03B
Electrodynamic processes in the ionopause are examined as well as the structure of the induced magnetosphere. Author

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N80-10991*# National Aeronautics and Space Administration, Washington, D. C.
ALGORITHMS FOR LOCATING CELESTIAL SOURCES OF X-RAYS AND GAMMA FLARES WITH THE AID OF SEVERAL SPACECRAFT
G. A. Mersov Oct. 1979 15 p refs Transl. into ENGLISH of "Algoritmy lokalizatsii nebesnykh istochnikov rentgenovskikh gamma-vspleskov s pomoshch' yu neskol' kikh ksomicheskikh apparatov", Rept. Pr-344 USSR Academy of Sciences, Inst. of Space Research, Moscow, 1977 p 1-14 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75920; Pr-344) Avail: NTIS HC A02/MF A01 CSCL 03B
An Algorithm is suggested for defining the coordinants of X-ray and Gamma Ray radiation sources by measuring the time lag of the transmission of radiation flares from various points of space in which spacecraft are located. Instances are cited where the 2-x, 3-x and 4x spacecraft are used. Author

99 GENERAL

N80-10992# Army Research Office, Research Triangle Park, N. C.
ELECTRONICS RESEARCH IN THE ARMY
Feb. 1979 27 p
(AD-A071805) Avail: NTIS HC A03/MF A01 CSCL 09/5
Contents: Solid-State Electronics; Electromagnetics; Communications; Computers; Signal Processing; and Integrated Circuits. GRA

N80-10993# Joint Publications Research Service, Arlington, Va.
USSR REPORTS: BIOMEDICAL AND BEHAVIORAL SCIENCE, NO. 112
23 Jul. 1979 109 p refs Transl. into ENGLISH from various Russian journals
(JPRS-73882) Avail: NTIS HC A06/MF A01
Articles are presented on agrotechnology, aerospace medicine, clinical medicine, ecology, ergonomics, deep sea exploration, physiology, and space medicine. For individual titles, see N80-10994 through N80-11001.

N80-10994# Joint Publications Research Service, Arlington, Va.
LODGING OF GRAIN CROPS AND ITS DETECTION BY AERIAL PHOTOGRAPHY c43
V. Ye. Budanov (All-Union Scientific Res. Inst. of Cybernetics) *In its* USSR Report: Biomedical and Behavioral Sci., No. 112 23 Jul. 1979 p 1-6 Transl. into ENGLISH from Zashchita Rasteniy (Moscow), no. 4, 1979 p 32-33 (For primary document see N80-10993 01-99)
Copyright. Avail: NTIS HC A06/MF A01
It was found that in several basic areas of grain production (northern Caucasus, nonchernozem areas, Kazakhstan, Ukraine, Belorussia and others) fermentative mycotic exhaustion especially increases under the influence of rainy weather, incessant dews and fogs. Investigations begun in various areas of the country in 1973 have made it possible to determine the basic features of the complicated biological mechanism causing the appearance, development and occurrence of the described phenomenon. The pathologic process occurs and develops under a certain combination of external and internal factors coming through successively and consists of the two following stages. The first stage is noninfectious and occurs during the phase of milk, wax and, less frequently, full ripeness of grain when the ears are moistened by rain, fog or continuous dews (with irrigated crops, during late watering when the grain is being formed). The second stage is infectious and is caused by saprophyte and semi-parasitic fungi from the genera of Alternaria, Cladosporium, Helminthosporium, Fusarium, etc. F.O.S.

N80-10995# Joint Publications Research Service, Arlington, Va.
HEALTH PROGNOSIS IN FLIGHT DISCUSSED c52
R. Bayevskiy *In its* USSR Report: Biomedical and Behavioral Sci., No. 112 23 Jul. 1979 p 10-12 Transl. into ENGLISH from Meditsinskaya Gazeta (Moscow), 30 May 1979 p 3 (For primary document see N80-10993 01-99)
Avail: NTIS HC A06/MF A01
A system of preventive measures to insure the rapid readaptation of a cosmonaut to the earth is discussed along with a method for predicting the state of health on long space flights. F.O.S.

N80-10996# Joint Publications Research Service, Arlington, Va.
THE THIRD SYSTEM OF REGULATION OF ANIMAL AND HUMAN FUNCTIONS, THE ACTIVE POINT SYSTEM c51
A. V. Zhirmunskiy (USSR Academy of Sciences, Vladivostok) and V. I. Kuzmin (USSR Academy of Sciences, Vladivostok) *In its* USSR Report: Biomedical and Behavioral Sci., No. 112 23 Jul. 1979 p 13-30 refs Transl. into ENGLISH from Zh. Obshchey Biologii (Moscow), no. 2, 1979 p 176-188 (For primary document see N80-10993 01-99)
Copyright. Avail: NTIS HC A06/MF A01
The identification of the mechanisms and structures for control of vital functions of organisms is discussed in terms of active points. F.O.S.

N80-10997# Joint Publications Research Service, Arlington, Va.
TWO IMPORTANT DIRECTIONS OF DEVELOPMENT OF SOVIET BIOMETRY c51
V. M. Shmidt (Leningrad State Univ.) *In its* USSR Report: Biomedical and Behavioral Sci., No. 112 23 Jul. 1979 p 31-46 refs Transl. into ENGLISH from Zh. Obshchey Biol. (Moscow), no. 2, 1979 p 219-228 (For primary document see N80-10993 01-99)
Copyright. Avail: NTIS HC A06/MF A01
The history and application of Soviet biometry are discussed in terms of correlation pleaids, and taxonomic analysis. F.O.S.

N80-10998# Joint Publications Research Service, Arlington, Va.
PRINCIPLES OF ERGONOMIC STANDARDS DISCUSSED c88
V. Munipov *In its* USSR Report: Biomedical and Behavioral

Sci., No. 112 23 Jul. 1979 p 47-54 refs Transl. into ENGLISH from Obshchestvennye Nauki (Moscow), no. 3, 1979 p 175-181 (For primary document see N80-10993 01-99)
Copyright. Avail: NTIS HC A06/MF A01

The theory and methodology of ergonomics is discussed. The establishment of unified sociopsychological and sociological criteria is examined and the principles of ergonomic research towards aspects of human labor are outlined. A.W.H.

N80-10999# Joint Publications Research Service, Arlington, Va.

MINISUBS FOR DEEP-SEA EXPLORATION **c48**

Aleksandr Durnev *In its* USSR Report: Biomedical and Behavioral Sci., No. 112 23 Jul. 1979 p 64-71 refs Transl. into ENGLISH from Tekhnika Molodezh' (Moscow), no. 4, 1979 p 24-26 (For primary document see N80-10993 01-99)
Avail: NTIS HC A06/MF A01

A history of the development of the U.S.S.R. research apparatus and programs for deep sea research is presented. Among the apparatuses discussed are minisubmarines and underwater laboratories, including the Bentox-300. A.W.H.

N80-11000# Joint Publications Research Service, Arlington, Va.

EVALUATION OF HEAT FLOW COMPONENTS FROM HEATER TO SKIN IN AN ELECTRIC THERMAL SUIT **c54**

I. M. Naumenko (Academy of Sciences Ukrainian SSR, Kiev) *In its* USSR Report: Biomedical and Behavioral Sci., No. 112 23 Jul. 1979 p 76-80 refs Transl. into ENGLISH from Dopovidi Akad. Nauk Ukrayinskoyi RSR (Kiev), no. 4, 1979 p 294-297 (For primary document see N80-10993 01-99)
Avail: NTIS HC A06/MF A01

The nature of heat transfer from the heater in an electric thermal suit to the human body is studied. An evaluation of the heat flow components of biological significance are presented. Information that prolonged exposure to low intensity radiant heat promotes an increase in the adenine nucleotides is discussed. A.W.H.

N80-11001# Joint Publications Research Service, Arlington, Va.

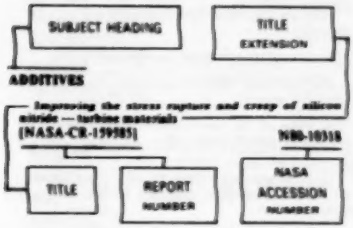
ULTRASTRUCTURE OF CHLORELLA PYRENOIDOSA CELLS (STRAIN g-11-1) FOLLOWING GROWTH UNDER CONDI-*TIONS OF A PROLONGED SPACE FLIGHT* **c51**

K. M. Sytnik (Academy of Sciences Ukrainian SSR, Kiev), Ye. L. Kordyum (Academy of Sciences Ukrainian SSR, Kiev), O. L. Mashynskyy (Academy of Sciences Ukrainian SSR, Kiev), A. F. Popova (Academy of Sciences Ukrainian SSR, Kiev), and H. M. Hrechko (Academy of Sciences Ukrainian SSR, Kiev) *In its* USSR Report: Biomedical and Behavioral Sci., no. 112 23 Jul. 1979 p 98-104 refs Transl. into ENGLISH from Dopovidi Akad. Nauk Ukrayinskoyi RSR (Kiev), no. 4, 1979 p 311-315 (For primary document see N80-10993 01-99)
Avail: NTIS HC A06/MF A01

The effects of space flight on the growth and viability of the unicellular alga Chlorella pyrenoidosa, analysed by studying the ultrastructure of the cell, is examined. Difference between *the control and experimental cells in the ultrastructure and volume* relationships of cytoplasmic organelles and storage material are described. The accelerated accumulation of biomass and the *accelerated ageing of the cells in space flight is discussed.* A.W.H.

SUBJECT INDEX

Typical Subject Index Listing



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A

ABERRATION
Design, engineering, and manufacturing aspects of gradient index optical components — lens design using aberration coefficients for gradient lens
N80-10900

ABLATIVE MATERIALS
Predicting the behavior of phenolic ablative materials
N80-10310

ABSORBERS (MATERIALS)
Analysis of a LiCl open-cycle absorption air conditioner which utilizes a packed bed for regeneration of the absorbent solution driven by solar heated air
[COO-4546-1] N80-10652

ABSORPTION SPECTRA
Measurements of anomalous dispersion of HF in absorption
[AD-A071044] N80-10331

AC GENERATORS
Program for the development of a superconducting generator, phase 2 and 3
[AD-A072093] N80-10439

ACCELERATION STRESSES (PHYSIOLOGY)
Course of altitude caisson disease in dogs exposed to accelerations
N80-10773

ACCELERATION TOLERANCE
An examination of statistical impact acceleration injury prediction models based on torque and force variables
[AD-A071625] N80-10746

ACOUSTIC ATTENUATION
Propagation of waves in a medium with high radiation pressure
[NASA-TM-75679] N80-10982

ACOUSTIC PROPAGATION
Coincidence of higher-order modes: A mechanism of the excitation of cylindrical shell vibrations via internal sound
N80-10510

High intensity sound research, 1961-1978
[AD-A072550] N80-10860

ACOUSTIC SCATTERING
Scattering of acoustic waves by elastic and viscoelastic obstacles of arbitrary shape immersed in a fluid
[AD-A072274] N80-10861

ACOUSTICAL HOLOGRAPHY
Digital reconstruction of acoustic holograms
N80-10475

ACOUSTICS
Aero-acoustic tests of duct-burning turbofan exhaust nozzles
[NASA-CR-162254] N80-10204
Flight effects on the aero/acoustic characteristics of inverted profile coannular nozzles
[NASA-CR-162419] N80-10220
Some problems of nonlinear waves in solid propellant rocket motors
N80-10301

ACRYLONITRILES
New binder system for composite solid propellants -- carboxyl terminated polybutadiene acrylonitrile liquid copolymer
N80-10295

ACTIVATED CARBON
Treatment of refinery wastewater using a filtration-activated carbon system
[PB-295790/1] N80-10972

ACTUATORS
Electromechanical flight control actuator
[NASA-CR-160346] N80-10224
Numerical simulation of dynamics of brushless dc motors for aerospace and other applications. Volume 1: Model development and applications, part A
[NASA-CR-160349] N80-10437

ADAPTIVE CONTROL
Sensitivity analysis of optimal linear random parameter systems
[AD-A071091] N80-10963

ADAPTIVE FILTERS
Research on adaptive antenna techniques 2
[AD-A071338] N80-10419

ADDITIVES
Improving the stress rupture and creep of silicon nitride — turbine materials
[NASA-CR-159585] N80-10318

ADENOSINE TRIPHOSPHATE
Effect of hypoxia on ATPase activity of the brain
N80-10776

ADIABATIC FLOW
Performance limits for liquid-metal heat pipes containing long adiabatic sections
[LA-UR-79-1241] N80-10472

AERIAL EXPLOSIONS
Airblast vulnerability envelopes for supersonic aerospace vehicles
[AD-A072247] N80-10201

AERIAL PHOTOGRAPHY
Analysis of water color as seen in orbital and aerial photographs of Cape Cod, Nantucket, and Martha's Vineyard, Massachusetts
N80-10567
Film exposure calculations
N80-10579
Strip trees: A hierarchical representation for map features
[AD-A071124] N80-10582
Lodging of grain crops and its detection by aerial photography
N80-10994

AERIAL RECONNAISSANCE
Aircraft measurements of micrometeorological parameters at Panama City, Florida, in 1978
[AD-A070956] N80-10737
Sierra cooperative pilot project, field
[PB-297065/5] N80-10741

AERODYNAMIC CHARACTERISTICS
Advanced missile technology. A review of technology improvement areas for cruise missiles — including missile design, missile configurations, and aerodynamic characteristics
[NASA-CR-3187] N80-10103
Recent developments in ejector technology in the Air Force: An overview
N80-10108
Low-speed wind-tunnel tests of a 1/10-scale model of an advanced arrow-wing supersonic cruise configuration designed for cruise at Mach 2.2 — Langley Full Scale Wind Tunnel
[NASA-TM-80152] N80-10135
Observations on parachute scale factors for modeling parachute deployment and steady state performance
[AD-A070571] N80-10138

Prediction of aerodynamic characteristics of fighter wings at high lift
[AD-A072630] N80-10140
Aero-acoustic tests of duct-burning turbofan exhaust nozzles
[NASA-CR-162254] N80-10204
Flight effects on the aero/acoustic characteristics of inverted profile coannular nozzles
[NASA-CR-162419] N80-10220

AERODYNAMIC COEFFICIENTS
Wing-body yawing moment and sideforce derivatives due to sideslip: Nv and Yv
[ESDU-79006] N80-10097

AERODYNAMIC CONFIGURATIONS
The significance of wing end configuration in airfoil design for civil aviation aircraft
[NASA-TM-75711] N80-10104
A simple apparatus for the experimental study of non-steady flow thrust-augmenter ejector configurations
N80-10125
Technical evaluation report on the fluid dynamics panel Symposium on High Angle of Attack aerodynamics — slender wings, bodies of revolution, and body-wing configurations
[AGARD-AR-145] N80-10147
AGARD two-dimensional aeroelastic configurations
[AGARD-AR-156] N80-10202

AERODYNAMIC DRAG
Effect of several airframe/nozzle modifications on the drag of a variable-sweep bomber configuration — conducted in langley 16 foot transonic tunnel
[NASA-TM-80129] N80-10106

AERODYNAMIC FORCES
Prediction of aerodynamic forces on a circular cylinder and thin airfoil on a transonic airstream by the finite element method
N80-10093
Wing-body yawing moment and sideforce derivatives due to sideslip: Nv and Yv
[ESDU-79006] N80-10097

AERODYNAMIC HEATING
Creep analysis of thin-wall structures subject to transient heating and loading
N80-10052

AERODYNAMIC LOADS
Effect of time dependent flight loads on JT9D-7 performance deterioration
[NASA-CR-159681] N80-10515

AERODYNAMICS
Soviet Aeronautics, volume 22, no. 1 — aerodynamics of gas turbine engines
N80-10061
Navigation and meteorological error equations for some aerodynamic parameters
[NASA-TM-80804] N80-10150

AEROELASTICITY
Study of the feasibility aspects of flight testing an aeroelastically tailored forward swept research wing on a BQM-34F drone vehicle
[NASA-CR-159149] N80-10195
AGARD two-dimensional aeroelastic configurations
[AGARD-AR-156] N80-10202
Study of a stereo electro-optical tracker system for the measurement of model deformations at the national transonic facility
[NASA-CR-159146] N80-10476

AERONAUTICAL ENGINEERING
Soviet aeronautics, volume 21, no. 3 — gas dynamics, flow characteristics, axial flow turbines, and gas turbine engines
N80-10001
NASA overview
N80-10109

AEROSOLS
Coagulation rates of sub-micron particulates in the troposphere
[PB-295756/1] N80-10695
Filters for collection of chemical aerosol and fume samples from the air
N80-10751

AEROSPACE ENVIRONMENTS
Elements of the theory of molecular spectra — multiatomic molecules
[NASA-TM-75686] N80-10866
General-purpose heat source project, space nuclear safety program, and radioisotopic terrestrial safety program
[LA-7560-PR] N80-10886

AEROSPACE MEDICINE
The effect of dynamic factors of space flight on animal organisms
[NASA-TM-75692] N80-10745

USSR Report: Biomedical and Behavioral Sciences, no. 122 — emphasizing pharmacology in space flight, psychometric test equipment, and air filters
[JPRS-74365] N80-10748
Problems of pharmacology in space medicine
N80-10749
USSR Report: Space Biology and Aerospace Medicine, volume 13, no. 5, 1979 — effects of space flight stress
[JPRS-74470] N80-10752
Current conceptions on the genesis of vestibulovegetative disorders in weightlessness
N80-10753
Aerospace medicine and biology: A continuing bibliography with indexes — October 1979
[NASA-SP-7011(196)] N80-10770
Research on the psychophysiological basis of human vigilance
[AD-A068562] N80-10790
Revised height/weight sizing programs for men's protective flight garments
[AD-A070732] N80-10805
USSR reports: Biomedical and behavioral science, no. 112
[JPRS-75082] N80-10993
AFTERBURNING
Characteristics of afterburning bypass turbojet engine with oxygen injection into the afterburner chamber — study of fuel injection into throat chambers for thrust augmentation
N80-10029
AGING (BIOLOGY)
Age-related distinctions of changes in psychophysiological functions of pilots in the civil aviation under the influence of vibration and noise
N80-10757
AGING (MATERIALS)
The ageing behaviour of solid rocket propellants regarding their mechanical properties
N80-10299
Summary of the Sandia Materials Information data bank — materials aging and compatibility data
[SAND-78-1961C] N80-10959
AGRICULTURAL AIRCRAFT
Spray nozzle designs for agricultural aviation applications — relation of drop size to spray characteristics and nozzle efficiency
[NASA-CR-159702] N80-10460
A study of the cost-effective markets for new technology agricultural aircraft
[NASA-CR-159090] N80-10962
AGRICULTURE
Energy and economic assessment of anaerobic digesters and biofuels for rural waste management
[PB-296523/4] N80-10398
Remote sensing applied to agricultural resources. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0733/0] N80-10508
On the consistency of the maximum likelyhood estimate of normal mixture parameters for a sample with field structure
[NASA-CR-160352] N80-10836
AIR CONDITIONING
MSFC solar heating and cooling high speed performance [Hisper] code validation
[NASA-CR-161323] N80-10604
Performance monitoring of an off-peak heating and cooling system utilizing thermal storage and solar augmented heat pump
[EPRI-ER-845] N80-10662
AIR CURRENTS
Mesoscale cloud patterns revealed by ASTP photographs
N80-10576
AIR DUCTS
Aerodynamic efficiency of gas turbine intake duct -- for gas turbine power plants
N80-10077
AIR FILTERS
Fabric filter model sensitivity analysis
[PB-297755/1] N80-10704
USSR Report: Biomedical and Behavioral Sciences, no. 122 — emphasizing pharmacology in space flight, psychometric test equipment, and air filters
[JPRS-74365] N80-10748
Filters for collection of chemical aerosol and fume samples from the air
N80-10751
AIR FLOW
Internal-external flow integration for a thin ejector-flapped wing section
N80-10113
AIR INTAKES
Aerodynamic efficiency of gas turbine intake duct -- for gas turbine power plants
N80-10077
Design of boundary-layer air intakes
N80-10079
AIR NAVIGATION
The evolution of JTIDS
N80-10179
JTIDS system overview
N80-10180
Navigation architecture — JTIDS relative navigation system
N80-10181
Integrated Tactical Navigation Systems (ITNS) — performance tests of navigation aids for rotorcraft nap-of-the-earth navigation
N80-10182
Human factors in the design and evaluation of aviation maps
[AGARD-AG-225] N80-10536
AIR POLLUTION
Emission reduction
N80-10207
Regional air pollution study. Dichotomous aerosol sampling system
[PB-297310/5] N80-10338
Experimental determination and modeling of dry deposition for ozone
N80-10684
The 1977 emissions inventory for southeastern Virginia — environment model of air quality based on exhaust emission from urban areas
[NASA-TM-80119] N80-10685
The impact of LNG spills on the environment: A comparison of dispersion models and experimental data
[UCRL-81812] N80-10688
Likelihood estimations of vegetative alteration near known or proposed sources of air pollution
[COO-4497-1] N80-10690
Compiling a multistate emissions inventory — fossil fuel electric power production
[BNL-25043] N80-10691
Coagulation rates of sub-micron particulates in the troposphere
[PB-295756/1] N80-10695
Emission assessment of conventional stationary combustion systems. Volume 2: Internal combustion sources
[PB-296396/8] N80-10696
Modeling the impacts of transportation systems management on vehicle emissions, phase I
[PB-296908/7] N80-10697
Statistical analysis of TSP and meteorological data in EPA region 6
[PB-296830/6] N80-10698
Analysis of organic air pollutants by gas chromatography and mass spectroscopy
[PB-296835/2] N80-10699
Regional air pollution, quality assurance audits
[PB-297576/1] N80-10702
Fabric filter model sensitivity analysis
[PB-297755/1] N80-10704
The economic impact of proposed regulations to reduce particulate emissions from steel mills and industrial fugitive sources, R78-11
[PB-296527/5] N80-10705
Example control strategy for ozone. Volume 2: Case study of the San Francisco Bay region, 1976-1978
[PB-297800/5] N80-10706
Analysis of priority pollutants at a primary aluminum production facility
[PB-297491/3] N80-10707
Mixing conditions and limit theorems for maxima of some stationary sequences
[COO-2874-38] N80-10844
AIR QUALITY
The 1977 emissions inventory for southeastern Virginia — environment model of air quality based on exhaust emission from urban areas
[NASA-TM-80119] N80-10685
AIR SAMPLING
Regional air pollution study. Dichotomous aerosol sampling system
[PB-297310/5] N80-10338
Thermogravimetric analysis of polymers in air
[AD-A070649] N80-10365
Regional air pollution, quality assurance audits
[PB-297576/1] N80-10702
Filters for collection of chemical aerosol and fume samples from the air
N80-10751
AIR TO AIR MISSILES
Gas generator propellants for air-to-air missiles
N80-10297
AIR TRAFFIC
IFR aircraft handled forecast by air route traffic control center, fiscal years 1979-1990
[AD-A070786] N80-10153
AIR TRAFFIC CONTROLLERS [PERSONNEL]
The development of the ATC selection battery: A new procedure to make maximum use of available information when correcting correlations for restriction in range due to selection
[AD-A066132] N80-10788
AIR TRANSPORTATION
IFR aircraft handled forecast by air route traffic control center, fiscal years 1979-1990
[AD-A070786] N80-10153
AIRBORNE INFECTION
Amount of microorganisms discharged from the upper respiratory tract and integument of people confined in a sealed chamber
N80-10767
AIRCRAFT COMPARTMENTS
Lexicon of aircraft transparency terms
[AD-A071319] N80-10200
AIRCRAFT CONTROL
Flying qualities research for highly augmented aircraft
[RE-582] N80-10194
AIRCRAFT DESIGN
Wind-tunnel investigation of the validity of a sonic-boom-minimization concept — Langley Unitary Plan Wind Tunnel tests for supersonic transport design
[NASA-TP-1421] N80-10102
The significance of wing end configuration in airfoil design for civil aviation aircraft
[NASA-TM-75711] N80-10104
Interface concerns of ejector integration in V/STOL aircraft
N80-10129
Design and test of a prototype scale ejector wing
N80-10131
The XFV-12A Thrust-Augmented Wing [TAW] prototype aircraft
N80-10133
A study of the cost-effective markets for new technology agricultural aircraft
[NASA-CR-159090] N80-10962
AIRCRAFT ENGINES
Soviet aeronautics, volume 21, no. 3 — gas dynamics, flow characteristics, axial flow turbines, and gas turbine engines
N80-10001
Long-life GTE operation based on technical condition — fatigue and service life monitoring of turbine blades in aircraft engines
N80-10027
Basic problem of aircraft gas turbine engine analytic design, part 1
N80-10042
Pneumatic distributor for turbojet engine control system — TU-154 aircraft
N80-10091
Aeropropulsion 1979 — conference
[NASA-CP-2092] N80-10205
Aircraft Energy Efficiency [ACEE] status report
N80-10206
Emission reduction
N80-10207
Noise reduction
N80-10208
Materials and structures technology
N80-10210
Turbomachinery technology
N80-10212
Mechanical components
N80-10213
Effect of time dependent flight loads on JT9D-7 performance deterioration
[NASA-CR-159681] N80-10515
AIRCRAFT FUELS
Alternative jet aircraft fuels
N80-10209
Hydrogen as a fuel. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0771/0] N80-10397
Aircraft fuel. Citations from the International Aerospace Abstracts Data Base
[NTIS/PS-79/0764/5] N80-10668
AIRCRAFT LANDING
A literature search and review of the dynamics of aircraft-surface interaction
[AD-A070940] N80-10199
AIRCRAFT MANEUVERS
Simulator for air-to-air combat motion system investigation
[AD-A072612] N80-10237
AIRCRAFT MODELS
Effect of winglets on a first-generation jet transport wing. 4: Stability characteristics for a full-span model at subsonic speeds — conducted in Langley 8 foot transonic pressure tunnel
[NASA-TP-1330] N80-10101
Study of a stereo electro-optical tracker system for the measurement of model deformations at the national transonic facility
[NASA-CR-159146] N80-10476
AIRCRAFT NOISE
Structural stiffening as an interior noise control technique for light twin-engine aircraft
N80-10192
AIRCRAFT PARTS
Mathematical models of the process of vibroabrasive grinding of parts with autonomous vibrations in the vibromachine container
N80-10023
AIRCRAFT PERFORMANCE
Manoeuvre limitations of combat aircraft
[AGARD-AR-155A] N80-10203
AIRCRAFT STABILITY
Soviet Aeronautics, volume 21, no. 4
N80-10031
AIRCRAFT STRUCTURES
Analysis of thin-wall beams by the method of segments
N80-10043

On the empennage snap-through problem
N80-10847
A study to develop optimization algorithms for aircraft wing structures
[AD-A072668] N80-10196
Angular vibration of aircraft. Volume 1: Executive summary
[AD-A071895] N80-10197
Angular vibration of aircraft. Volume 2: Prediction methods for angular vibration
[AD-A071749] N80-10198
Swept frequency scattering measurements of aircraft — target identification
[AD-A071474] N80-10420

AIRCRAFT SURVIVABILITY
Airblast vulnerability envelopes for supersonic aerospace vehicles
[AD-A072247] N80-10201

AIRFOIL PROFILES
A flight investigation of performance and loads for a helicopter with NLR-1T main-rotor blade sections
[NASA-TM-80165] N80-10136
AGARD two-dimensional aeroelastic configurations
[AGARD-AR-156] N80-10202

AIRFOILS
The significance of wing end configuration in airfoil design for civil aviation aircraft
[NASA-TM-75711] N80-10104
Use of wagner functions in airfoil design optimization
[AD-A072634] N80-10139

AIRFRAMES
Effect of several airframe/nozzle modifications on the drag of a variable-sweep bomber configuration — conducted in langley 16 foot transonic tunnel
[NASA-TM-80129] N80-10106

AIRLINE OPERATIONS
Factors affecting the retirement of commercial transport jet aircraft
[NASA-CR-152308] N80-10148
Cargo Logistics Airlift Systems Study [CLASS]. Volume 4: Future requirements of dedicated freighter aircraft to year 2000
[NASA-CR-158950-VOL-4] N80-10149

ALASKA
Summary of major energy legislation of the 95th Congress
[DOE/TIC-10118] N80-10644
Circulation and hydrography near Kodiak Island, September to November 1977
[PB-297421/0] N80-10743

ALGAE
Fuels by algae hydrogenation
N80-10375

ALGORITHMS
Algorithms and logic for incorporating ILS NASA TCV B-737 airplane area navigation system
[NASA-TM-80167] N80-10132
An improvement in Fourier transform accuracy — statistical analysis of fourier transformation algorithms when seeking a single frequency
N80-10261
A theory and an algorithm for analog circuit fault diagnosis
N80-10426
Variable sample time algorithms for microcomputer control of distributed parameter systems
N80-10430
Algorithm for constructing the programmed motion of a bounding vehicle for the flight phase
[NASA-TM-75668] N80-10497
The extended Kalman filter as pulmonary blood flow estimator
N80-10779
Set covering algorithms using cutting planes, heuristics, and subgradient optimization: A computational study
[AD-A072458] N80-10820
Algorithm for enhancing low-contrast details in digital images
[UCID-18015] N80-10827
Test problems for constrained nonlinear mathematical programming algorithms
[ANL-AMD-TM-320-REV-1] N80-10828
Algorithms for locating celestial sources of X-rays and gamma flares with the aid of several spacecraft
[NASA-TM-75920] N80-10991

ALLOYS
Alloys obtained in a state of weightlessness
N80-10270

ALPHA PARTICLES
Alpha transport and blistering in tokamaks
[SAND-78-8684] N80-10916

ALTERNATING CURRENT
AC superconducting cables
[BNL-26016] N80-10441

ALTITUDE SICKNESS
Course of altitude caisson disease in dogs exposed to accelerations
N80-10773

ALUMINUM
The development of aluminum-aluminum oxide alloys by mechanical alloying
N80-10340
Analysis of priority pollutants at a primary aluminum production facility
[PB-297491/3] N80-10707

ALUMINUM ALLOYS
Determination of constitutive equations for high strength Aluminum and Titanium alloys applicable to sheet metal formability
[AD-A072123] N80-10346
Fracture mechanics and surface chemistry studies of fatigue crack growth in an aluminum alloy
[AD-A071438] N80-10519

ALUMINUM GALLIUM ARSENIDES
Rectification at N-N GaAS: [Ga, Al]As heterojunctions
[AD-A071732] N80-10937
Rectification at nGaAs - n Ga.7Al.3As heterojunctions grown by LPE
[AD-A071733] N80-10938

ALUMINUM OXIDES
The development of aluminum-aluminum oxide alloys by mechanical alloying
N80-10340
Physical properties data compilations relevant to energy storage. 3: Engineering properties of single and polycrystalline sodium beta and beta-alumina
[PB-297047/6] N80-10945

ALVEOLAR AIR
Investigation of alveolo-arterial difference for oxygen and carbon dioxide when breathing high-density gas mixtures
N80-10774

AMAZON REGION [SOUTH AMERICA]
South American river morphology and hydrology
N80-10574

AMINES
Preparation and characterization of polymer-bound polydentate amines
[AD-A071150] N80-10364

AMMONIUM NITRATES
Gas generator propellants for air-to-air missiles
N80-10297

AMORPHOUS MATERIALS
Improvement of wear-resistance properties of natural aggregates by materials impregnation
[BNL-25396] N80-10323
Creep and recovery of amorphous polymers — polymer physics and creep analysis applied to amorphous materials and polycarbonates to discover creep properties
N80-10339

AMPLIFICATION
Application factor of two-dimensional transverse sonic jet interacting with supersonic stream — study of amplification factor of two dimensional jet in supersonic flow and turbulent boundary layer
N80-10082

AMPLITUDE DISTRIBUTION ANALYSIS
Variation of seismic source parameters and stress drop within a descending slab as revealed from body-wave pulse-width and amplitude analysis, part 1. A seismological investigation of the subduction mechanism of aseismic ridges, part 2
N80-10710

ANALOG CIRCUITS
Frequency down-converters as applied to VLBI
N80-10251
A theory and an algorithm for analog circuit fault diagnosis
N80-10426

ANALOG TO DIGITAL CONVERTERS
Electronic reduction of high speed mass spectral data
[SAND-79-0709] N80-10336

ANALOGS
Analog modeling in studying supersonic flow around a wing and its governing analog-criteria
N80-10038

ANALYSIS OF VARIANCE
On estimating variance of robust estimators when the errors are asymmetric
[AD-A072598] N80-10839

ANCHORS [FASTENERS]
Fatigue and corrosion fatigue of HY-80 steel, as applicable to anchor bolt failures
[AD-A072067] N80-10330

ANGLE OF ATTACK
Technical evaluation report on the fluid dynamics panel Symposium on High Angle of attack aerodynamics — slender wings, bodies of revolution, and body-wing configurations
[AGARD-AR-145] N80-10147

ANGOLA
ASTP photographs of southeastern Angola
N80-10557

ANGULAR ACCELERATION
Experiments in sensing transient rotational acceleration cues on a flight simulator
[NASA-TP-1537] N80-10193
Angular vibration of aircraft. Volume 1: Executive summary
[AD-A071895] N80-10197
Angular vibration of aircraft. Volume 2: Prediction methods for angular vibration
[AD-A071749] N80-10198

ANISOTROPIC MEDIA
Analytical solutions for heat conduction in anisotropic media homogeneous in cylindrical coordinates at rest and in motion
N80-10452

ANISOTROPY
Dynamic response of a slab of elastic-viscoplastic material that exhibits induced plastic anisotropy
[ISSN-0072-9310] N80-10513
Energy transfer in anisotropic systems. A: Excitation migration in substitutionally disordered one-dimensional solids. B: The spectroscopy of molecules absorbed on metal surfaces
[LBL-6332] N80-10648

ANNULAR FLOW
An experimental investigation of forced mixing of a turbulent boundary layer in an annular diffuser — turbulent mixing in annular flow mixers and vortex generators
N80-10096

ANNULAR NOZZLES
Coannular supersonic ejector nozzles
N80-10128
Flight effects on the aeroacoustic characteristics of inverted profile coannular nozzles
[NASA-CR-162419] N80-10220

ANTENNA ARRAYS
Research on adaptive antenna techniques 2
[AD-A071338] N80-10419

ANTENNA DESIGN
Shuttle orbiter Ku-band radar/communications system design evaluation: High gain antenna/wideband horn
[NASA-CR-160316] N80-10275
Minimum cost transmitter-receiver antenna pairs — antenna design for the satellite solar power station using optimal control theory
[RM-490] N80-10414
Theory, analysis, and design of a new type of stripfed slot array
N80-10427

ANTENNA FEEDS
Radio frequency performance of DES 14 64-m antenna at X-band using a dual hybrid mode feed
N80-10258

ANTENNA RADIATION PATTERNS
DEN CONSCAN: A vector nomenclature and method for determining parameter values
N80-10256

ANTENNAS
Temperature deformations of the mirror of a radio telescope antenna
[NASA-TM-75633] N80-10908

ANTHROPOMETRY
Revised height/weight sizing programs for men's protective flight garments
[AD-A070732] N80-10883

ANTIFRICTION BEARINGS
Equilibrium temperatures in self-contained bearing assemblies. Part 2: First approximation to temperature rise
[ESDU-78027] N80-10495

APERTURES
Coded aperture imaging: A comparison between Fresnel zone apertures and uniformly redundant array apertures
[SAND-78-1625] N80-10481
Serrated apertures: Statistical diffraction theory and experiments
N80-10982

APOLLO SOYUZ TEST PROJECT
Apollo-Soyuz test project. Volume 2: Earth observations and photography
[NASA-SP-412-VOL-2] N80-10538
Summary of significant results
N80-10539
Geologic analysis of ASTP photographs of parts of southern California
N80-10540
Evaluation of satellite images of the Levantine Rift zone
N80-10542
Riachao Ring, Brazil: A possible meteorite crater discovered by the Apollo astronauts
N80-10552
Color zoning in the western desert of Egypt
N80-10553
Orbital observations of sand distribution in the western desert of Egypt
N80-10554
Preliminary analysis of color variations of sand deposits in the western desert of Egypt
N80-10555
Temporal changes as depicted on orbital photographs of arid regions in North Africa
N80-10556
ASTP photographs of southeastern Angola
N80-10557
Color of desert surfaces in the Arabian peninsula
N80-10558
Monte Desert of San Juan, Argentina, as photographed by ASTP
N80-10559

Dunes and other windforms of central Australia, and a comparison with linear dunes on the Moenkopi Plateau, Arizona
N80-10560

Determining photograph locations over oceans
N80-10561

Interpreting ASTP photographs of the ocean and locating the area photographed, case study of the Gulf of Mexico
N80-10562

Visual observations over oceans
N80-10563

ASTP at Barbados: Mesoscale pools of Amazon River water in the western tropical Atlantic
N80-10568

Estimate of total reflectance from the Orinoco River outflow — from Apollo Soyuz Test Project photographs
N80-10569

Observations of internal-wave surface signatures in ASTP photographs
N80-10570

Suspended-sediment dispersal patterns of river deltas photographed by ASTP
N80-10572

Use of Apollo-Soyuz photographs in coastal studies
N80-10573

Mesoscale cloud patterns revealed by ASTP photographs
N80-10576

Comparison of astronaut visual color observations with ASTP photographs
N80-10577

Film selection for the earth observations and photography experiment
N80-10578

ASTP photographic film processing and sensitometric summary
N80-10580

Photogrammetric analysis of ASTP earth observations experiment data
N80-10581

APOLLO 16 FLIGHT

Lunar crustal magnetic anomalies detected by the Apollo subsatellite magnetometers
N80-10985

APPALACHIAN MOUNTAINS [NORTH AMERICA]

Regional geochemical exploration for mineral deposits in the appalachians of central and northwestern Virginia
N80-10534

APPROACH

Pilot performance during simulated approaches and landings made with various computer-generated visual glidepath indicators
[AD-A066220] N80-10151

APPROPRIATIONS

NASA authorization for fiscal year 1980. Part 4: Index
[GPO-51-336] N80-10964

APPROXIMATION

Field state estimation by least squares
N80-10040

Stress-strain diagram approximation
N80-10055

Approximate calculation of the laminar boundary layer in micronozzles
N80-10076

Effects of truncation in modal representations of thermal convection
[NASA-CR-162251] N80-10457

Equilibrium temperatures in self-contained bearing assemblies. Part 2: First approximation to temperature rise
[ESDU-78027] N80-10495

ARABIAN SEA

Color of desert surfaces in the Arabian peninsula
N80-10570

ARCHES

Vibration frequencies of an arch model under various loading conditions
[PB-297987/0] N80-10529

ARCHITECTURE [COMPUTERS]

Navigation architecture — JTIDS relative navigation system
N80-10181

MATE support software analysis
[AD-A079931] N80-10824

Proceedings of the Third Berkeley Workshop on distributed data management and computer networks
[LBL-7953] N80-10831

Proceedings of AESOP-SCIE symposium on advanced computing
[CONF-781066-P2] N80-10846

ARCTIC REGIONS

Long-term tracking of artic icebergs
[AD-A072473] N80-10583

AREA NAVIGATION

Algorithms and logic for incorporating ILS NASA TCV B-737 airplane area navigation system
[NASA-TM-80167] N80-10152

ARGENTINA

Monte Desert of San Juan, Argentina, as photographed by ASTP
N80-10559

ARGON

Thermal conductivity of the helium-argon system — prediction analysis techniques for thermal conductivity of argon helium gas mixtures
[ANL-79-3] N80-10953

ARID LANDS

Temporal changes as depicted on orbital photographs of arid regions in North Africa
N80-10556

ARIZONA

Dunes and other windforms of central Australia, and a comparison with linear dunes on the Moenkopi Plateau, Arizona
N80-10560

ARMED FORCES [UNITED STATES]

Electronics research in the Army
[AD-A071085] N80-10992

ARROW WINGS

Low-speed wind-tunnel tests of a 1/10-scale model of an advanced arrow-wing supersonic cruise configuration designed for cruise at Mach 2.2 — Langley Full Scale Wind Tunnel
[NASA-TM-80152] N80-10135

ARTIFICIAL INTELLIGENCE

Decision making, fuzzy set theory and computers
[AD-A071942] N80-10815

ARTILLERY FIRE

The 1978DA GSRS, round numbers B-2 and B-3 21 February 1979
[AD-A070814] N80-10728

ASIA

Source and propagation effects of Rayleigh waves from central Asian earthquakes — and the geological structure of New England
[AD-A070241] N80-10714

Typhoon report, 1978
[AD-A070904] N80-10732

ASPECT RATIO

Flow-around small-aspect-ratio delta wing with vortex 'bursting'
N80-10060

ASSEMBLY LANGUAGE

Project Aries: Users manual for Arius 2 and associated subsystems
[AD-A072471] N80-10818

ASTRONAUTS

Antipodal seas — astronaut observation of ocean features
N80-10564

Ocean color observations — by astronauts
N80-10566

ASTRONOMICAL CATALOGS

Near infrared photographic sky survey. 1: Catalog of red stellar objects
[NASA-CR-162306] N80-10978

ASTRONOMICAL COORDINATES

Algorithms for locating celestial sources of X-rays and gamma fluxes with the aid of several spacecraft
[NASA-TM-79920] N80-10991

ASTRONOMY

Geophysics, astronomy and space, no. 452
[JPRS-74125] N80-10269

ASYMPTOTES

Asymptotic freedom without guilt — quantum chromodynamics and quark confinement
[UH-511-329-79] N80-10952

ATLANTIC OCEAN

ASTP at Barbados: Mesoscale pools of Amazon River water in the western tropical Atlantic
N80-10568

Offshore pipeline corridors and landfalls in coastal Virginia, volumes 1 and 2 and appendices
[PB-297439/2] N80-10708

ATLAS LAUNCH VEHICLES

Launch Vehicles — for the gps satellites
N80-10176

ATMOSPHERIC CIRCULATION

Stratospheric H2O — atmospheric circulation models
[UCRL-82542] N80-10717

Investigation of possible sun-weather relationships
[PB-297385/7] N80-10719

ATMOSPHERIC COMPOSITION

Evaluation of atmospheric trace constituent sensors operating from remote space and airborne platforms
[NASA-CR-162365] N80-10711

On the structure of the upper atmosphere of Mars according to data from experiments on the Viking space vehicles
[NASA-TM-75717] N80-10989

ATMOSPHERIC DIFFUSION

The impact of LNG spills on the environment: A comparison of dispersion models and experimental data
[UCRL-81812] N80-10688

ATMOSPHERIC ENTRY

Meteorological data analysis in support of the ABRES Program
[AD-A070946] N80-10729

ATMOSPHERIC MODELS

Experimental determination and modeling of dry deposition for ozone
N80-10684

Magnetopause layer and plasma boundary layer of the magnetosphere
[LA-UR-78-2992] N80-10715

Stratospheric H2O — atmospheric circulation models
[UCRL-82542] N80-10717

ATMOSPHERIC MOISTURE

Stratospheric H2O — atmospheric circulation models
[UCRL-82542] N80-10717

ATMOSPHERIC RADIATION

A correlation between auroral kilometric radiation and inverted-V electron precipitation
[NASA-CR-162399] N80-10713

Evaluation of the passive remote crosswind sensor — detecting the movement of atmospheric scintillations
[AD-A071178] N80-10730

ATMOSPHERIC REFRACTION

Refraction corrections for surveying
[NASA-TM-80803] N80-10907

ATMOSPHERIC TEMPERATURE

The 12823A lance missile number 4724 round number 332 NCL
[AD-A072044] N80-10738

ATMOSPHERIC TURBULENCE

Turbulence environment characterization
[AD-A072379] N80-10736

The spherical wave phase difference temporal power spectra for light beams degraded by a turbulent atmosphere
N80-10898

ATOMIC CLOCKS

Demonstration of remote clock monitoring by VLB1, with three baseline closure
N80-10247

ATOMIC COLLISIONS

Atom-surface interactions derived from scattering data
N80-10925

ATOMIC EXCITATIONS

Modified method of perturbed stationary states 1
[SAND-78-0235] N80-10893

ATOMIC PHYSICS

Semiclassical quantization of Nonseparable Hamiltonian Systems — measure and integration of hamiltonian function in atomic physics
N80-10865

ATOMIC STRUCTURE

Electronic characteristics of 3 - 5 compounds — electrophysics study of atomic structures of gallium arsenides and indium phosphides
[AD-A071447] N80-10939

ATOMIC THEORY

Theory of electron transfer and ionization
[CONF-790430-1] N80-10876

AUDITORY PERCEPTION

Speech illusions and significance thereof to aerospace practice
N80-10736

AURORAS

A correlation between auroral kilometric radiation and inverted-V electron precipitation
[NASA-CR-162399] N80-10713

AUSTRALIA

Photogeologic analysis of ASTP photographs of the Lake Torrens-Flinders Ranges-Lake Blanche area, South Australia — identification of folds, faults, and lineaments
N80-10530

Dunes and other windforms of central Australia, and a comparison with linear dunes on the Moenkopi Plateau, Arizona
N80-10560

AUTOMATIC CONTROL

On modeling sensitivity of a linear system to reduction of its order by the infinitesimal transformation method in the yaw motion control problem
N80-10046

AUTOMATIC FLIGHT CONTROL

The inverse problem of control system guaranteed sensitivity
N80-10032

AUTOMATIC FREQUENCY CONTROL

DSN tracking system uplink frequency control
N80-10253

AUTOMOBILE ENGINES

Energy storage systems for automobile propulsion, 1978 study. 1: Overview and findings
[UCRL-52553-VOL-1] N80-10970

AUTOMOBILE FUELS

Hydrogen as a fuel. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0771/0] N80-10397

AUTOREGRESSIVE PROCESSES

Mixing conditions and limit theorems for maxima of some stationary sequences
[COO-2874-38] N80-10844

AVIONICS

MATE support software analysis
[AD-A079931] N80-10824

AXIAL COMPRESSION LOADS

Influence of initial deflections on buckling of cylindrical shells under creep conditions with combined action of axial compression and internal pressure
N80-10839

AXIAL FLOW
Experimental investigation of annular cascade performance
[AD-A072442] N80-10464
AXIAL FLOW TURBINES
On axial turbine stage rotor blade twist with tangential tilt of the stator vanes
N80-10086
Nonstationarity of heat transfer in axial turbine blading during engine startup
N80-10089
AXISYMMETRIC BODIES
Flow around axisymmetric bodies: The direct and inverse problems
N80-10180
AXISYMMETRIC FLOW
Large-scale turbulent structures in jets and in flows over cavities and their relationship to entrainment and mixing
N80-10123
AZIMUTH
Antenna azimuth bearing model experiment
N80-10257

B

BACKSCATTERING
Lunar radar backscatter studies
[NASA-CR-162415] N80-10986
BALLISTICS
Erosive and transient burning effects on performance prediction accuracy of tactical rockets
N80-10291
Improving the all weather ballistic and mechanical properties of smokeless propergols
N80-10300
BAND STRUCTURE OF SOLIDS
Modulated structures in inorganic one-dimensional metals — tetracyanoplatinate and bisoxalatoplatinate
[CONF-790341-7] N80-10333
BARBADOS
ASTP at Barbados: Mesoscale pools of Amazon River water in the western tropical Atlantic
N80-10568
BATTERY CHARGERS
Nickel cadmium batteries. Volume 1: Citations from the NTIS data base
[NTIS/PS-79/0646/4] N80-10669
Nickel cadmium batteries. Volume 2: A bibliography with abstracts
[NTIS/PS-79/0647/2] N80-10670
BAYS [TOPOGRAPHIC FEATURES]
Hydrographic observations in the Georgia Bight, July 1977
[PB-297135/6] N80-10742
BEAM CURRENTS
Two-dimensional nonstationary model of the propagation of an electron beam in a vacuum
[NASA-TM-75693] N80-10435
BEAMS [SUPPORTS]
Analysis of thin-wall beams by the method of segments
N80-10043
On thin-wall beam effective stiffness
N80-10057
BEARINGS
Design criteria for dry lubricated flight control bearings — wear tests to make design analysis and check equipment specifications
[AD-A071322] N80-10228
BEHAVIOR
Effect of hypokinesia on higher nervous activity of albino rats
N80-10762
BENDING
Ductility in bending of molybdenum alloys irradiated between 425 and 1000C
[CONF-790125-53] N80-10334
BIBLIOGRAPHIES
Boundary layer control. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0812/2] N80-10145
Boundary layer separation. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0813/0] N80-10146
Metal matrix composites, volume 2: A bibliography with abstracts
[NTIS/PS-79/0680/3] N80-10324
Metal matrix composites. Volume 3: A bibliography with abstracts
[NTIS/PS-79/0681/1] N80-10325
Hydrogen as a fuel. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0771/0] N80-10397
Hydrogen production. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0773/6] N80-10401
Hydrogen storage as a hydride. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0772/8] N80-10402
Joint services electronics program — a bibliography with abstracts
[AD-A072076] N80-10438
Strip transmission lines, volume 2. Citations from the NTIS data base — bibliography with abstracts
[NTIS/PS-79/0618/3] N80-10445
Strip transmission lines. Volume 3: Citations from the engineering index data base
[NTIS/PS-79/0620/9] N80-10446
Strip transmission lines. Volume 2: Citations from the engineering index data base
N80-10447
Nondestructive ultrasonic testing and inspection. Volume 3: Citations from the engineering index data base
[NTIS/PS-79/0636/5] N80-10505
Nondestructive ultrasonic testing and inspection. Volume 4: Citations from the engineering index data base, April 1978 May 1979
[NTIS/PS-79/0637/3] N80-10506
Mathematical analysis of stress cracks volume 2. A bibliography with abstracts
[NTIS/PS-79/0803/1] N80-10530
Mathematical analysis of stress cracks, volume 3. A bibliography with abstracts
[NTIS/PS-79/0804/9] N80-10531
Remote sensing applied to agricultural resources. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0733/8] N80-10588
Lithium batteries: Citations from the Engineering Index data base
[NTIS/PS-79/0676/1] N80-10666
Waste utilization as an energy source. Citations from the International Aerospace Abstracts Data Base
[NTIS/PS-79/0765/2] N80-10667
Aircraft fuel. Citations from the International Aerospace Abstracts Data Base
[NTIS/PS-79/0764/5] N80-10668
Nickel cadmium batteries. Volume 1: Citations from the NTIS data base
[NTIS/PS-79/0646/4] N80-10669
Nickel cadmium batteries. Volume 2: A bibliography with abstracts
[NTIS/PS-79/0647/2] N80-10670
Lithium batteries. Volume 2: Citations from the NTIS data base
[NTIS/PS-79/0674/6] N80-10671
Lithium batteries. Volume 3: Citations from the NTIS data base
[NTIS/PS-79/0675/3] N80-10672
Microwave heating: Applications and equipment. Citations from NTIS data base
[NTIS/PS-79/0631/6] N80-10673
Microwave heating: Industrial applications. Citations from the engineering data base
[NTIS/PS-79/0632/4] N80-10674
Lead batteries, volume 1. Citations from the engineering index data base
[NTIS/PS-79/0781/9] N80-10680
Lead batteries, volume 2. Citations from the engineering index data base
[NTIS/PS-77/0634] N80-10681
Lead batteries. Citations from the NTIS data base
[NTIS/PS-79/0780/1] N80-10682
Aerospace medicine and biology: A continuing bibliography with indexes — October 1979
[NASA-SP-7011(198)] N80-10778
Liquid crystals, volume 1. A bibliography with abstracts
[NTIS/PS-79/0795/9] N80-10947
Liquid crystals, volume 2. A bibliography with abstracts
[NTIS/PS-79/0796/7] N80-10948
NASA Tech Briefs Index, 1978 — bibliography
[NASA-SP-7021(20)] N80-10967
NASA Tech Briefs Index, 1977, volume 2, numbers 1-4
[NASA-SP-7021(19)] N80-10968
Cumulative Index to NASA Tech Briefs, 1970-1975 — bibliographies
[NASA-SP-7021(18)] N80-10969
BINARY ALLOYS
Effects of stoichiometry and neutron irradiation in superconducting A-15 compounds
[BNL-29940] N80-10944
BINARY SYSTEMS [MATERIALS]
Thermodynamics of precipitation systems — thermodynamic properties of precipitation hardening in binary systems
[ORNL-5537] N80-10935
BIOASTRONAUTICS
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[JPRS-74470] N80-10752
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N80-11001
BIOCHEMISTRY
Kidney cell electrophoresis
[NASA-CR-160353] N80-10782
BIODYNAMICS
The third system of regulation of animal and human functions, the active point system
N80-10996
BIOELECTRIC POTENTIAL
A model for auditory evoked potentials
N80-10780
BIOELECTRICITY
A model for auditory evoked potentials
N80-10780
BIOLOGICAL EFFECTS
Aerospace medicine and biology: A continuing bibliography with indexes — October 1979
[NASA-SP-7011(198)] N80-10778
Ultrastructure of chlorella pyrenoidosa cells [strain g-11-1] following growth under conditions of a prolonged space flight
N80-11001
BIOLOGY
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[JPRS-73882] N80-10993
BIOMASS
Biomass-based alcohol fuels: The near-term potential for use with gasoline
[HCP/T4101-03] N80-10393
Design of a pilot silvicultural biomass farm at the Savannah River Plant
[HCP/T4101-01] N80-10394
Energy and economic assessment of anaerobic digesters and biofuels for rural waste management
[PB-296323/4] N80-10398
Growing energy: Land for biomass farms
[PB-296650/5] N80-10400
BIOMASS ENERGY PRODUCTION
Fuels by algae hydrogenation
N80-10775
Biomass energy enhancement: A report to the President's Council on Environmental Quality — solar heat gasification
[PB-296634/0] N80-10396
BIOMEDICAL DATA
Plasma volume changes in fit men and women during a humid heat stress before and after an acclimation
N80-10781
BIOMETRICS
Two important directions of development of Soviet biometry
N80-10997
BIONICS
A model for auditory evoked potentials
N80-10780
BIOSYNTHESIS
The biological conversion of corn residue into ethyl alcohol using an immobilized-cell reactor
N80-10376
BISMUTH COMPOUNDS
Growth of bismuth tungstate single crystals — hydrothermal crystal growth of single crystals
[COO-1198-1261] N80-10940
BITS
Design of a quick-look decoder for the DSN (7,1/2) convolutional code — Galileo Project
N80-10233
BIVARIATE ANALYSIS
Bivariate distributions with given marginals and fixed measures of dependence
[LA-7780-MS] N80-10851
BLACK HOLES [ASTRONOMY]
Hydrodynamics of primordial black hole formation
[NASA-TM-75918] N80-10983
BLANKETS [FUSION REACTORS]
Stainless steel blanket concept for tokamaks
[WFPS-TME-79-010] N80-10919
One- and two-dimensional heating analyses of fusion synfuel blankets
[BNL-NUREG-25635] N80-10922
BLASIUS FLOW
Forced response of a Blasius flat-plate boundary layer to an external vortex street
[AD-A072486] N80-10462
BLIGHT
Lodging of grain crops and its detection by aerial photography
N80-10994
BLISTERS
Thermal conduction effects in human skin. Phase 2: Experimental validation and application of data in selection of materials
[AD-A068408] N80-10783
BLOOD VOLUME
Plasma volume changes in fit men and women during a humid heat stress before and after an acclimation
N80-10781
BODIES OF REVOLUTION
Technical evaluation report on the fluid dynamics panel Symposium on High Angle of Attack aerodynamics — slender wings, bodies of revolution, and body-wing configurations
[AGARD-AR-145] N80-10947
BODY TEMPERATURE
Evaluation of heat flow components from heater to skin in an electric thermal suit
N80-11000
BODY-WING CONFIGURATIONS
Wing-body yawing moment and sideforce derivatives due to sideslip: Nv and Yv
[ESDU-79006] N80-10997

Investigation of the boundary condition at a wind tunnel test section wall for a lifting wing-body model at low supersonic speed
[AD-A072898] N80-10142
Technical evaluation report on the fluid dynamics panel Symposium on High Angle of attack aerodynamics — slender wings, bodies of revolution, and body-wing configurations
[AGARD-AR-145] N80-10147
BOILERS
MDAC/Rockwell-ynn solar receiver: Design review
[SAND-78-8188] N80-10616
Solar generation of industrial steam. Innovative research program outreach
[COO-4546-9] N80-10656
BOILING WATER REACTORS
Improved RELAP4 jet pump model
[CAAP-TR-046] N80-10580
BOLTS
Fatigue and corrosion fatigue of HY-80 steel, as applicable to anchor bolt failures
[AD-A072867] N80-10350
BORING MACHINES
Borehole geological assessment
[NASA-CASE-NPO-14231-1] N80-10709
BORON FLUORIDES
Quantitative spectroscopic studies of boron oxides and fluorides
[AD-A070997] N80-10332
BORON ISOTOPES
Study of structure of light nuclei with neutrons
[COO-2490-9] N80-10872
BORON OXIDES
Quantitative spectroscopic studies of boron oxides and fluorides
[AD-A070997] N80-10332
BOUNDARY LAYER COMBUSTION
Boundary layer models of erosive burning
N80-10291
BOUNDARY LAYER CONTROL
Boundary layer control. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0812/2] N80-10145
BOUNDARY LAYER FLOW
Investigation of the boundary condition at a wind tunnel test section wall for a lifting wing-body model at low supersonic speed
[AD-A072898] N80-10143
BOUNDARY LAYER SEPARATION
Integral solutions of the high Reynolds number small separation problem
N80-10099
Boundary layer control. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0812/2] N80-10145
Boundary layer separation. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0813/0] N80-10146
BOUNDARY LAYER TRANSITION
Forced response of a Blasius flat-plate boundary layer to an external vortex street
[AD-A072406] N80-10462
BOUNDARY LAYERS
Design of boundary-layer air intakes
N80-10079
Magnetopause layer and plasma boundary layer of the magnetosphere
[LA-UR-78-2992] N80-10715
BOUNDARY VALUE PROBLEMS
Algorithm for constructing the programmed motion of a bounding vehicle for the flight phase
[NASA-TM-75660] N80-10497
On the numerical solution of Helmholtz equation by the finite element method
[DOE/ER/45443-79] N80-10840
Modeling for moving boundary problems
[CONF-790545] N80-10843
BOW WAVES
Ion acceleration at the earth's bow shock: A review of observations in the upstream region
[LA-UR-79-309] N80-10984
BRAIN
Effect of hypoxia on ATPase activity of the brain
N80-10776
BRAYTON CYCLE
Brayton isotope power system, phase I
[TID-28927] N80-10615
BRAZIL
Volcanic landforms and astroblemes
N80-10551
Riachao Ring, Brazil: A possible meteorite crater discovered by the Apollo astronauts
N80-10552
BREATHING APPARATUS
Portable breathing system — a breathing apparatus using a rebreathing system of heat exchangers for carbon dioxide removal
[NASA-CASE-MSC-16182-1] N80-10799
BROADCASTING
Satellite direct broadcasting: The prospects for development — economic factors of satellite transmissions for direct broadcasting of television
N80-10410
BRUSHES
Wear of modified electrical brush material in vacuum
[RAE-TRANS-2007] N80-10436
BUCKET BRIGADE DEVICES
Study of the optimum charge-transfer image sensor — photoelectric radiation measuring instruments with bucket brigade devices for imaging techniques
N80-10431
BUCKLING
Collapse load analysis for plates and shells
[AD-A071649] N80-10518
BUILDINGS
The building loads analysis and system thermodynamics blast program. Version 2.0: users manual, volume 2
[AD-A072273] N80-10484
Thermal and lighting efficiency standards
[PB-297429/3] N80-10488
BUNCHING
Telescoping beams for heavy ion fusion
[CONF-790327-100] N80-10917
BURNERS
Development of combustion data to utilize low Btu gases as industrial process fuels. Project 61004 special report no. 4: High-forward-momentum burner
[FE-2489-33] N80-10390
BURNING RATE
Boundary layer models of erosive burning
N80-10291
Composite propellant burn rate modeling
N80-10292
Erosive and transient burning effects on performance prediction accuracy of tactical rockets
N80-10293
Gas generator propellants for air-to-air missiles
N80-10297
BUTADIENE
New binder system for composite solid propellants — carboxyl terminated polybutadiene acrylonitrile liquid copolymer
N80-10298

C

C-8A AUGMENTOR WING AIRCRAFT
NASA overview
N80-10189
CABIN ATMOSPHERES
Toxic effects of chemicals in the altered gas environment of pressurized chambers
N80-10775
CALCIUM SILICATES
Analysis of the response of a thermal barrier coating to sodium and vanadium doped combustion gases
[NASA-TM-79205] N80-10344
CALCULATORS
Convergence zone prediction models with programs for use on HP-67 and HP-97 programmable calculators
[AD-A072050] N80-10809
CALIBRATING
The calibration of a roundness standard
[PB-297708/0] N80-10406
CALIFORNIA
Geologic analysis of ASTP photographs of parts of southern California
N80-10540
Energy transition in California
[UCRL-15003] N80-10619
CAMERA SHUTTERS
Film exposure calculations
N80-10379
CANADA
Standards system in Canada, the UK, West Germany, and Denmark: An overview
[PB-296912/9] N80-10407
CANOPIES
Lexicon of aircraft transparency terms
[AD-A071319] N80-10200
CARBON DIOXIDE
Investigation of alveolourterial difference for oxygen and carbon dioxide when breathing high-density gas mixtures
N80-10774
CARBON DIOXIDE LASERS
Multiple photon process in SF6
N80-10425
High peak power pulsed WIP electron gun
[UCRL-13950] N80-10877
CARBON DIOXIDE REMOVAL
Portable breathing system — a breathing apparatus using a rebreathing system of heat exchangers for carbon dioxide removal
[NASA-CASE-MSC-16182-1] N80-10799
Extended duration orbiter study: CO2 removal and water recovery
[NASA-CR-160317] N80-10800
CARBON FIBERS
The scatter of mechanical values of carbon fiber composites and its causes — statistical values of strength
[NASA-TM-75698] N80-10317
The potential of carbon fiber induced shock hazards in household toasters
[NASA-CR-159147] N80-10434
CARBON MONOXIDE
Multiple steady states of the oxidation of carbon monoxide on a supported platinum catalyst
N80-10327
The combined effect of carbon monoxide and hypokinesia
N80-10763
CARBON 13
Study of structure of light nuclei with neutrons
[COO-2490-9] N80-10872
CARBORANE
Linked and mercury-bridged nido-carboranes. High yield synthesis of mu, mu prime- [CH3) 2C2B4H5]2Hg, conversion to 3,3prime-[CH3) 2C2B4H52, cleavage, and oxidative addition of benzene. Synthesis of mu,mu prime-[t-bu)2]2g
[AD-A070777] N80-10333
Nickel boron hybrid clusters: Synthesis of polyhedral nickelaboranes and nickelacarboranes from small borane and carborane anions. Crystal structure of [eta5-C5H5)4Ni4B4H4
[AD-A070926] N80-10345
CARBOXYL GROUP
New binder system for composite solid propellants — carboxyl terminated polybutadiene acrylonitrile liquid copolymer
N80-10298
CARDIOVASCULAR SYSTEM
Some hemodynamic parameters during respiration of oxygen under excessive pressure
N80-10765
CARGO AIRCRAFT
Cargo Logistics Airlift Systems Study [CLASS]. Volume 4: Future requirements of dedicated freighter aircraft to year 2000
[NASA-CR-158950-VOL-4] N80-10149
CARRIER FREQUENCIES
Digital PSK to BiO-L demodulator for 2 sup n/bit rate] carrier
[NASA-TM-80159] N80-10433
CASCADE FLOW
Experimental study of the gasdynamic characteristics of a stator cascade with cooling air discharge through the vane surface
N80-10809
On the influence of relative pitch in the subsonic turbine cascade
N80-10814
Laser Doppler Velocimeter [LDV] study of secondary flows in turbine cascade
N80-10890
Experimental investigation of annular cascade performance
[AD-A072442] N80-10464
CAST ALLOYS
Constant and variable loading fatigue strength of black-heart malleable cast iron regarding metallurgical characteristics
[ICAF-1009] N80-10511
CATALYSIS
Start up system for hydrogen generator used with an internal combustion engine
[NASA-CASE-NPO-13849-1] N80-10374
CATALYSTS
Fischer-Tropsch synthesis over nickel catalysts — chemical reaction of nickel catalysts over hydrocarbons
N80-10326
Multiple steady states of the oxidation of carbon monoxide on a supported platinum catalyst
N80-10327
Preparation and characterization of polymer-bound polydentate amines
[AD-A071150] N80-10364
CAVITY RESONATORS
A performance evaluation of mini-laser cartridge devices
[AD-A072705] N80-10488
CELLS (BIOLOGY)
The biological conversion of corn residue into ethyl alcohol using an immobilized-cell reactor
N80-10376
Scalar diffraction analysis of light scattering by epithelial cells from a line focused laser beam
N80-10484
Ultrastructural changes in canine hepatocytes during continuous chronic exposure to low doses of gamma radiation
N80-10768
Kidney cell electrophoresis
[NASA-CR-160353] N80-10782
Ultrastructure of chlorella pyrenoidosa cells [strain g-11-1] following growth under conditions of a prolonged space flight
N80-11001
CENTRAL NERVOUS SYSTEM
Effect of hypokinesia on higher nervous activity of albino rats
N80-10762

CENTRAL PROCESSING UNITS
User's guide: SPAR processor MIN analysis of inelastic three-dimensional solids, part 2
[NASA-CR-161321] N80-10514
CENTRIFUGES
Use of short-arm centrifuge to prevent deconditioning when immersed in water [according to H-reflex]
N80-10772
CERAMIC COATINGS
Investigation of microtubular ceramic structures — fabricating heat exchangers using polyurethane foam and ceramic coatings
[AD-A072144] N80-10349
CERAMICS
Improving the stress rupture and creep of silicon nitride — turbine materials
[NASA-CR-159385] N80-10318
Development of silicon nitride of improved toughness
[NASA-CR-159676] N80-10319
Contact stress analysis of ceramic-to-metal interfaces
[AD-A072073] N80-10522
CEREBELLUM
Levels and proportion of RNA and proteins in the system of the neuron: Vestibular nuclear neuroglia and cerebellum during hypokinesia
N80-10764
CERMETS
Development of cermets for high level radioactive waste fixation
[CONF-790420-10] N80-10890
CH-47 HELICOPTER
Training effectiveness of the CH-47 flight simulators
[AD-A072317] N80-10236
CHANNEL FLOW
Generalized heat and mass transfer law for internal flows
N80-10073
Application of gradient method to study of heat transfer in axisymmetric channels of different configuration
N80-10080
CHANNELS [DATA TRANSMISSION]
Distributed TDMA: An approach to JTIDS phase 2
N80-10189
Design of a quick-look decoder for the DSN (7,1/2) convolutional code — Galileo Project
N80-10253
CHARACTERIZATION
Analytic representation of turbine characteristics in form convenient for computer calculation of GTE parameters
N80-10024
CHARGE EXCHANGE
Intermediate energy, inelastic, and charge exchange nucleon-nucleus scattering
N80-10879
CHARGE TRANSFER
Theory of electron transfer and ionization
[CONF-790438-1] N80-10876
CHARGED PARTICLES
Heavy lepton phenomenology
[SLAC-PUB-2219] N80-10883
CHELATES
Preparation and characterization of polymer-bound polydentate amines
[AD-A071150] N80-10364
CHEMICAL LASERS
On the rational design of compressible flow ejectors
N80-10114
DARPA-NRL laser program
[AD-A072359] N80-10489
CHEMICAL REACTIONS
Fischer-Tropsch synthesis over nickel catalysts — chemical reaction of nickel catalysts over hydrocarbons
N80-10326
Nickel boron hybrid clusters: Synthesis of polyhedral nickelaboranes and nickelacarbaboranes from small boranes and carboranes anion. Crystal structure of [eta5-C5H5]4Ni4B4H4
[AD-A070926] N80-10345
Studies of chemical and mechanical surface phenomena by particle emission techniques
N80-10933
CHEMICAL REACTORS
The biological conversion of corn residue into ethyl alcohol using an immobilized-cell reactor
N80-10376
Sodium storage and injection system
[NASA-CASE-NPO-14304-1] N80-10494
Novel duplex vapor: Electrochemical method for silicon solar cells — chemical reactor for a silicon sodium reaction system
[NASA-CR-162387] N80-10597
CHEMILUMINESCENCE
Chemiluminescence of diphenyl peroxide. Pulsed laser spectrophotometric detection of radical ion intermediates on the CIEEL path
[AD-A071151] N80-10486
CHLORELLA
Ultrastructure of chlorella pyrenoidosa cells [strain p-11-1] following growth under conditions of a prolonged space flight
N80-11001
CHOLESTEROL
Physics of mesomorphic compounds — cholesteric liquid crystal
[AD-A070539] N80-10935
CHROMATES
Dichromate oxidability as a criterion of quantitative levels of organic impurities in reclaimed water
N80-10766
CIRCLES [GEOMETRY]
The calibration of a roundness standard
[PB-297708/0] N80-10406
CIRCUIT DIAGRAMS
Density and reliability predictions for a general logic structure for custom LSI
N80-10250
Electronic reduction of high speed mass spectral data
[SAND-79-0709] N80-10336
CIRCULAR CYLINDERS
On the laminar boundary on the surface of a cylinder moving in a fluid
N80-10036
Prediction of aerodynamic forces on a circular cylinder and thin airfoil in a transonic airstream by the finite element method
N80-10093
CITIES
Hydrologic modeling and data requirements for analysis of urban streamflow management alternatives
[PB-296499/7] N80-10591
The 1977 emissions inventory for southeastern Virginia — environment model of air quality based on exhaust emission from urban areas
[NASA-TM-80119] N80-10685
Critical research needs in community water management
[PB-293984/9] N80-10973
Municipal Wastewater Treatment Facility, winter 1978
[PB-296813/9] N80-10974
CIVIL AVIATION
The significance of wing and configuration in airfoil design for civil aviation aircraft
[NASA-TM-75711] N80-10104
Age-related distinctions of changes in psychophysiological functions of pilots in the civil aviation under the influence of vibration and noise
N80-10757
CLADDING
The relationships of the process variables and material properties on clad-rolled metals
N80-10343
CLASSICAL MECHANICS
Microscopic classical equations of motion calculations of high-energy heavy-ion collisions
N80-10880
CLEANING
Study of a tokamak cleaning method utilizing glow discharge
[ORNL-TR-4664] N80-10921
CLINICAL MEDICINE
The extended Kalman filter as pulmonary blood flow estimator
N80-10779
The third system of regulation of animal and human functions, the active point system
N80-10996
CLOSED ECOLOGICAL SYSTEMS
Types of aquatic microcosms and their research applications
[CONF-781101-1] N80-10747
CLOUD PHOTOGRAPHS
Mesoscale cloud patterns revealed by ASTP photographs
N80-10576
CLOUD PHYSICS
Sierra cooperative pilot project, field
[PB-297065/5] N80-10741
CLOUDS [METEOROLOGY]
Mesoscale cloud patterns revealed by ASTP photographs
N80-10576
COAGULATION
Coagulation rates of sub-micron particulates in the troposphere
[PB-295756/1] N80-10695
COAL
Methane recovery from coalbeds
[DOE/MC-08089-T1] N80-10387
Computer software to calculate and map geologic parameters required in estimating coal production costs
[EPRI-EA-674] N80-10584
COAL GASIFICATION
Coal conversion processes and analysis methodologies for synthetic fuels production — technology assessment and economic analysis of reactor design for coal gasification
[NASA-CR-161322] N80-10379
Screening evaluation of novel power cycles integrated with gasification plants
[EPRI-AF-1002] N80-10405
Socioeconomic data requirements for environmental assessment: Coal gasification and liquefaction projects
[CONF-780843-5] N80-10693
Wastewater treatment in coal conversion
[PB-297587/8] N80-10700
Health and environmental effects of coal gasification and liquefaction technologies: A workshop summary and panel reports
[PB-297618/1] N80-10701
COAL LIQUEFACTION
Socioeconomic data requirements for environmental assessment: Coal gasification and liquefaction projects
[CONF-780843-5] N80-10693
COAL UTILIZATION
Continuous coal processing method and means
[NASA-CASE-NPO-13758-2] N80-10377
Coal conversion processes and analysis methodologies for synthetic fuels production — technology assessment and economic analysis of reactor design for coal gasification
[NASA-CR-161322] N80-10379
Fluidized-bed combustion of high sulfur coals
[METC/RI-79/4] N80-10386
Research guidance studies to assess gasoline from coal by methanol-to-gasoline and sand-type Fischer-Tropsch technologies
[FE-2447-13] N80-10388
Coal conversion systems: Technical data book
[HCP/T2286-01] N80-10392
NASA-Lewis closed-cycle magnetohydrodynamics plant analysis
[NASA-TM-79049] N80-10395
COASTAL ECOLOGY
Offshore pipeline corridors and landfalls in coastal Virgina, volumes 1 and 2 and appendices
[PB-297439/2] N80-10708
COASTAL WATER
Use of Apollo-Soyuz photographs in coastal studies
N80-10573
The use of satellites in environmental monitoring of coastal waters
[NASA-CR-162409] N80-10687
COASTS
Use of Apollo-Soyuz photographs in coastal studies
N80-10573
COAXIAL FLOW
Study of self-oscillatory liquid film flow regime in coaxial air stream
N80-10004
COCKPIT SIMULATORS
Video control center and cockpit simulator
[AD-A071313] N80-10234
COEFFICIENT OF FRICTION
Wear of modified electrical brush material in vacuum
[RAE-TRANS-2007] N80-10436
COEFFICIENTS
Mass transfer and liquid-liquid dispersion in agitated vessels — mass transfer coefficients and drop size in soluble liquid-liquid interfaces after mixing
N80-10449
Design, engineering, and manufacturing aspects of gradient index optical components — lens design using aberration coefficients for gradient lens
N80-10900
COGNITION
Evoked cortical potentials and information processing
[AD-A070789] N80-10794
COGNITIVE PSYCHOLOGY
A study of complex learning theory and methodologies
[AD-A068323] N80-10792
COLLAPSE
Collapse load analysis for plates and shells
[AD-A071649] N80-10518
COLLISION PARAMETERS
Electron excitation cross sections for multiply charged ions
[ORO-4881-23] N80-10868
COLOR PHOTOGRAPHY
Color of desert surfaces in the Arabian peninsula
N80-10558
Monte Desert of San Juan, Argentina, as photographed by ASTP
N80-10559
Dunes and other windforms of central Australia, and a comparison with linear dunes on the Moenkopi Plateau, Arizona
N80-10560
Analysis of water color as seen in orbital and aerial photographs of Cape Cod, Nantucket, and Martha's Vineyard, Massachusetts
N80-10567
Comparison of astronaut visual color observations with ASTP photographs
N80-10577
Film selection for the earth observations and photography experiment
N80-10578

Film exposure calculations
N80-10579

COLOR VISION
Comparison of astronaut visual color observations with ASTP photographs
N80-10577

Use of the pupil to study the scotopic and chromatic mechanisms of vision in humans
N80-10777

COLORADO
Mineral resources and land-use planning, the Watkins, Colorado case: A workshop synopsis [ANL/LRP/TM-7]
N80-10985

COMBUSTION
On the flame stabilization mechanism in two-phase fuel-air mixture flow
N80-10013

Analysis of flame stabilization conditions using the homogeneous reactor model
N80-10017

Research in the field of solid propellant rockets: A survey
N80-10282

Aluminum combustion under rocket motor conditions
N80-10294

Combustion of aluminum in solid propellant flames
N80-10295

Acid digestion of combustible waste [HEDL-TME-78-77]
N80-10614

COMBUSTION CHAMBERS
Influence of gas turbine engine combustion chambers geometric parameters on mixture formation characteristics
N80-10006

Study of non-uniformity of combustion chamber temperature field with primary zone parameter variation — of fuel-air parameters
N80-10045

Study of mass exchange between primary zone and secondary air jets in gas turbine engine combustion chambers
N80-10075

Experimental evaluation of a low emissions high performance duct burner for Variable Cycle Engines (VCE) — supersonic cruise aircraft research [NASA-CR-159694]
N80-10221

A two-dimensional model of the interaction of a transverse jet in a supersonic stream with application to supersonic combustion
N80-10328

Analytical modeling of flash-back phenomena — premixed/prevaporized combustion system [NASA-CR-162309]
N80-10330

COMBUSTION CONTROL
Erosive and transient burning effects on performance prediction accuracy of tactical rockets
N80-10293

COMBUSTION EFFICIENCY
Dynamics of diesel fuel combustion in turbulent flow
N80-10074

Near term potential of wood as a fuel [BCP/C4101]
N80-10389

Development of gas turbine fuels and combustion; An overview [CONF-790137-4]
N80-10391

COMBUSTION PHYSICS
Modeling of flame properties of methanol [UCRL-82434]
N80-10385

COMBUSTION PRODUCTS
X-ray spectroscopy as a diagnostic tool in solid propellant combustion flows [AD-A070796]
N80-10380

Fluidized-bed combustion of high sulfur coals [METC/RI-79/4]
N80-10386

Compiling a multistate emissions inventory — fossil fuel electric power production [BNL-25843]
N80-10651

COMBUSTION STABILITY
On stability of operation of Liquid Rocket Engine with Turbopump Assembly (TPA)
N80-10034

The role of particulate damping in the control of combustion instability by aluminum combustion
N80-10296

Some problems of nonlinear waves in solid propellant rocket motors
N80-10301

Recent ONERA studies on combustion instabilities in solid propellant rocket motors
N80-10302

Application of combustion instability research to solid propellant rocket motor problems
N80-10303

self-sustained oscillatory combustion of solid rocket propellants
N80-10304

Nonlinear combustion instability in solid propellant rocket motors: Influence of geometry and propellant formulation
N80-10306

The suppression of combustion instability by particulate damping in smokeless solid propellant motors
N80-10307

COMMAND AND CONTROL
The evolution of JTIDS
N80-10179

JTIDS system overview
N80-10180

Navigation architecture — JTIDS relative navigation system
N80-10181

Command and control terminals — systems engineering of command and control terminals for pulse communication navigation aids
N80-10185

JTIDS II/DTDMA - command and control terminals
N80-10190

COMMERCIAL AIRCRAFT
Factors affecting the retirement of commercial transport jet aircraft [NASA-CR-152308]
N80-10148

Aircraft Energy Efficiency (ACEE) status report
N80-10206

COMMUNICATION EQUIPMENT
Electronics research in the Army [AD-A071805]
N80-10992

COMMUNICATION NETWORKS
The evolution of JTIDS
N80-10179

JTIDS system overview
N80-10180

Navigation architecture — JTIDS relative navigation system
N80-10181

Communication network synchronization in the presence of noise
N80-10411

The 30/20 GHz mixed user architecture development study [NASA-CR-159686]
N80-10415

The 30/20 GHz mixed user architecture development study: Executive summary [NASA-CR-159687]
N80-10416

COMPENSATORS
Issues in the digital implementation of control compensators [NASA-CR-162416]
N80-10814

COMPILERS
MPS-PASCAL: A pascal implementation for microprocessor-based computer systems [AD-A071972]
N80-10806

Heuristics for determining equivalence of program mutations [AD-A071795]
N80-10815

COMPLEX SYSTEMS
Analytic design of complex systems, II
N80-10016

COMPOSITE MATERIALS
Materials and structures technology
N80-10210

Composites in future motor hardware: A research view
N80-10309

Predicting the behavior of phenolic ablative materials
N80-10310

COMPOSITE PROPELLANTS
Technical evaluation report on the Propulsion and Energetics Panel 53rd Symposium on Solid Rocket Motor Technology [AGARD-AR-151]
N80-10290

Composite propellant burn rate modeling
N80-10292

New binder system for composite solid propellants - - carboxyl terminated polybutadiene acrylonitrile liquid copolymer
N80-10298

The ageing behaviour of solid rocket propellants regarding their mechanical properties
N80-10299

Low frequency oscillatory combustion: Experiments and results
N80-10305

Material problems in jet vane thrust vector control systems
N80-10308

COMPOSITE STRUCTURES
Analyses of plates constructed of fibre-reinforced biaxodales composite materials [AD-A071377]
N80-10320

Finite-element analysis of laminated composite-material plates [AD-A071390]
N80-10321

Recent research in composite and sandwich plate dynamics [AD-A072277]
N80-10322

Collapse load analysis for plates and shells [AD-A071949]
N80-10318

COMPRESSED GAS
Experimental determination of heat transfer coefficient when emptying gas vessels — study of heat transfer coefficient in pneumatic equipment for compressed gas in a pressure vessel
N80-10030

Calculation of working process in slow-compression piston-type aerodynamic tube
N80-10062

COMPRESSIBILITY
High temperature science: Future needs and anticipated development in high-density shock-wave research [UCID-18072]
N80-10857

COMPRESSIBLE FLOW
Study of radial diffusers with flow swirl — profile of a vaneless diffusion in a compressible invicid flow
N80-10025

On the rational design of compressible flow ejectors
N80-10114

An efficient user-oriented method for calculating compressible flow in an about three-dimensional inlets — panel method [NASA-CR-159578]
N80-10134

VNAP: A computer program for computation of two-dimensional, time-dependent compressible, viscous, internal flow [LA-7326]
N80-10470

COMPUTATIONAL FLUID DYNAMICS
Computational fluid mechanics of internal flow
N80-10211

COMPUTER ASSISTED INSTRUCTION
A memory retrieval aid for hypothesis generation [AD-A072657]
N80-10795

COMPUTER DESIGN
Proceedings of AESOP-SCIE symposium on advanced computing [CONF-781061-P2]
N80-10046

COMPUTER GRAPHICS
Computer mapping software and geographic data base development: Oak Ridge National Laboratory user experience [CONF-780727-1]
N80-10586

Progressive refinement of raster images [AD-A072517]
N80-10823

User's guide to PLOTIN/MYPLOT. A general-purpose plotting routine for use with AMD graphics [ANL/RER/TM-3]
N80-10829

Analysis and computerized fitting of the lineshape of the NMR powder pattern [IS-4516]
N80-10874

COMPUTER NETWORKS
The NOCC radio science subsystem: System performance validation for the DSN radio science and Very Long Baseline Interferometry (VLBI) systems
N80-10252

Proceedings of the Third Berkeley Workshop on distributed data management and computer networks [LBL-7953]
N80-10831

COMPUTER PROGRAMMING
Stress analysis of cylindrical pressure vessels with closely spaced nozzles by the finite-element method. Volume 3: Vessels with three nozzles under internal pressure and external loadings [NUREG-CR-0907-VOL-3]
N80-10527

VAL: A value-oriented algorithmic language (preliminary reference manual) [AD-A072394]
N80-10826

Test problems for constrained nonlinear mathematical programming algorithms [ANL-AMD-TM-320-REV-1]
N80-10828

COMPUTER PROGRAMS
Analytic representation of turbine characteristics in form convenient for computer calculation of GTE parameters
N80-10024

An efficient user-oriented method for calculating compressible flow in an about three-dimensional inlets — panel method [NASA-CR-159578]
N80-10134

A Reed-Solomon decding program for correcting both errors and erasures
N80-10254

DSN tracking system uplink frequency control
N80-10255

DSN CONSCAN: A vector nomenclature and method for determining parameter values
N80-10256

Short description of mathematical support programs for space experiments in the interkosmos program [NASA-TM-75629]
N80-10263

The building loads analysis and system thermodynamics blast program. Version 2.0: users manual, volume 2 [AD-A072273]
N80-10404

Computer calculations of traveling-wave periodic structure properties [SLAC-PUB-2295]
N80-10423

VNAP: A computer program for computation of two-dimensional, time-dependent compressible, viscous, internal flow [LA-7326]
N80-10470

User's guide: SPAR processor MN analysis of inelastic three-dimensional solids, part 2 [NASA-CR-161321]
N80-10514

Use of computer structural programs for the dynamic analysis of satellites structures [AGARD-R-698]
N80-10532

Computer software to calculate and map geologic parameters required in estimating coal production costs [EPRI-EA-674]
N80-10584

MSFC solar heating and cooling high speed performance [Hisper] code validation
[NASA-CR-161323] N80-10004
Sensitivity study of CFAS and CFAR objective analysis techniques
[AD-A071452] N80-10734
Convergence zone prediction models with programs for use on HP-67 and HP-97 programmable calculators
[AD-A072056] N80-10809
BEYSIK: Language description and handbook for programmers [system for the collective use of the Institute of Space Research, Academy of Sciences USSR]
[NASA-TM-75680] N80-10813
TARADCOM signal analysis program — user manual
[AD-A072014] N80-10817
An improved FORTRAN recognizer
[AD-A071334] N80-10822
Identification and validation of quantitative measures of the psychological complexity of software
[AD-A072547] N80-10825
COMPUTER STORAGE DEVICES
Optimization of computer operating systems
[AD-A071463] N80-10834
COMPUTER SYSTEMS DESIGN
Special purpose computer to computer interface
[IS-T-830] N80-10811
The design and verification of an operating system kernel
[AD-A072552] N80-10819
Computer systems conversion: A management perspective
[PB-297604/1] N80-10832
On the design of an interactive information retrieval program
[CONF-780990-1] N80-10960
COMPUTER SYSTEMS PROGRAMS
A method of computer-aided generation of software for digital system controllers using fixed-instruction machines
N80-10812
MATE support software analysis
[AD-A070931] N80-10824
Computer systems conversion: A management perspective
[PB-297604/1] N80-10832
Application of queueing models to multiprogrammed computer systems operating in a time-critical environment
[NASA-TM-80143] N80-10834
On the design of an interactive information retrieval program
[CONF-780990-1] N80-10960
COMPUTER TECHNIQUES
Pilot performance during simulated approaches and landings made with various computer-generated visual glidepath indicators
[AD-A066220] N80-10131
Algorithms and logic for incorporating ILS NASA TCV B-737 airplane area navigation system
[NASA-TM-80167] N80-10152
A portable stand for assessing the dynamics of a working individual's functional state — based on a microprocessor
N80-10720
Manual of documentation practices applicable to defense-aerospace scientific and technical information, volume 2
[AGARD-AG-235-VOL-2] N80-10961
COMPUTERIZED DESIGN
Analytic design of complex systems, II
N80-10016
Computer aided design study of hypermixing nozzles
N80-10116
Multivariable digital control systems
[AD-A071662] N80-10226
Computer model for ductile fracture — nuclear reactor pressure vessels
[UCID-18970] N80-10526
Analysis techniques for use with the extended SDM model
[AD-A071647] N80-10808
COMPUTERIZED SIMULATION
Flying qualities research for highly augmented aircraft
[RE-582] N80-10194
A study to develop optimization algorithms for aircraft wing structures
[AD-A072668] N80-10196
A literature search and review of the dynamics of aircraft-surface interaction
[AD-A070940] N80-10199
Algorithm for constructing the programmed motion of a bounding vehicle for the flight phase
[NASA-TM-75648] N80-10497
Study to analyze and synthesize satellite data
[AD-A070947] N80-10712
A tactical system emulator for a distributed microcomputer architecture
[AD-A072578] N80-10810
Continuous simulation of queueing networks with transient and time varying conditions
N80-10833
Safeguards methodology development history — computerized simulation of safety factors in reactor design for reactor safety
[SAND-79-0859C] N80-10892
Computer simulation of kinetic properties of plasma — magnetic fusion energy
[COO-2209-10] N80-10920
COMPUTERS
Optimization of computer operating systems
[AD-A071463] N80-10834
Electronics research in the Army
[AD-A071805] N80-10992
CONCENTRATION [COMPOSITION]
Remote sensing of LNG spill vapor dispersion using Raman LIDAR
[UCRL-13984] N80-10699
Investigation of alveolo-arterial difference for oxygen and carbon dioxide when breathing high-density gas mixtures
N80-10724
CONCENTRATORS
Determination of strain fields near concentrators from strain gage indicators
N80-10054
Determination of the technical and economic feasibility of luminescent solar concentrators
[SAND-79-7005] N80-10430
CONDUCTION BANDS
Dependence of conduction band energy and electron mobility on fluid density
[BNL-26072] N80-10941
CONDUCTIVE HEAT TRANSFER
Most rational linearization of nonlinear unsteady heat conduction problems
N80-10082
Semi-empirical method for determining local heat transfer coefficients for flow around a sphere — effects of conductive heat transfer on subsonic flow distribution
N80-10084
Transient phenomena in thermal explosion of confined gases
N80-10373
Analytical solutions for heat conduction in anisotropic media homogeneous in cylindrical coordinates at rest and in motion
N80-10452
Evaluation of heat flow components from heater to skin in an electric thermal suit
N80-11980
CONFERENCES
Workshop on Thrust Augmenting Ejectors
[NASA-CP-2099] N80-10107
Aeropropulsion 1979 — conferences
[NASA-CP-2092] N80-10205
Technical evaluation report on the Propulsion and Energetics Panel 53rd Symposium on Solid Rocket Motor Technology
[AGARD-AR-151] N80-10280
Solid rocket motor technology
[AGARD-CP-259] N80-10281
Waste Heat Utilization: Proceedings of 1978 Engineering Foundation Conference
[CONF-7809102] N80-10665
The 1978 symposium on the Rio Grande Rift. Program and abstracts
[LA-7487-C] N80-10726
Introduction to VECTRAN and its use in scientific applications programming
[LA-7491-C] N80-10830
Proceedings of the Third Berkeley Workshop on distributed data management and computer networks
[LBL-7953] N80-10831
Proceedings of AESOP-SCIE symposium on advanced computing
[CONF-781061-P2] N80-10946
Acoustic Fluctuation Workshop: Technical review, editorial summary, synopsis and papers, volume I
[AD-A072309] N80-10862
Sandia Irradiator for Dried Sewage Solids
[SAND-79-0182] N80-10971
Performance and upgrading of wastewater stabilization ponds — conferences
[PB-297504/3] N80-10977
CONFINEMENT
Amount of microorganisms discharged from the upper respiratory tract and integument of people confined in a sealed chamber
N80-10767
CONGRESSIONAL REPORTS
Oversight: Space shuttle cost, performance, and schedule review
[GPO-50-365] N80-10274
Passive solar energy programs and plans
[GPO-36-211] N80-10599
NASA authorization for fiscal year 1980. Part 4: Index
[GPO-51-336] N80-10964
CONIFERS
A thermal vegetation canopy model of sensor response
N80-10535
CONSERVATION LAWS
Method of lines approach to the numerical solution of conservation laws — time dependent solutions of hyperbolic partial differential equations
[LA-UR-79-837] N80-10841
CONSTITUTIVE EQUATIONS
Determination of constitutive equations for high strength Aluminum and Titanium alloys applicable to sheet metal formability
[AD-A072121] N80-10346
CONSTRUCTION
Longitudinal joint systems in slip-formed rigid pavements. Volume 1: Literature survey and field inspection
[AD-A066320] N80-10230
CONSTRUCTION MATERIALS
Statistical optimization of structural thermal protection material thickness
N80-10015
Fracture characteristics of structural steels, reference manual
[AD-A072056] N80-10349
CONTACT POTENTIALS
Electrical charging of fabric and film materials
N80-10048
CONTINUOUS WAVE LASERS
High peak power pulsed WIP electron gun
[UCRL-13990] N80-10877
CONTOURS
The turbulent boundary layer on a curvilinear surface
N80-10020
Use of wagner functions in airfoil design optimization
[AD-A072634] N80-10139
CONTROL
Manned engineering flight simulation validation, Part 1. Simulation requirements and simulator motion system performance
[AD-A071394] N80-10235
Cost-effective control systems for solar heating and cooling applications
[SAN-1392-1] N80-10658
CONTROL STABILITY
Comparison of stability and control parameters for a light, single-engine, high-winged aircraft using different flight test and parameter estimation techniques
[NASA-TM-80163] N80-10225
CONTROL SURFACES
Electromechanical flight control actuator
[NASA-CR-160348] N80-10224
Numerical simulation of dynamics of boundless direct motors for aerospace and other applications. Volume 1: Model development and applications, part A
[NASA-CR-160349] N80-10437
CONTROL THEORY
On modeling sensitivity of a linear system to reduction of its order by the (bilinear)-transformation method in the yaw motion control problem
N80-10046
Method of conjugate gradients for optimal control problems with state variable constraints
[AD-A072258] N80-10227
Frequency-domain approaches to linear multivariable control systems design — control theory and mathematical models for linear frequency control systems
N80-10432
Dynamics and control: Energy conversion, delivery, and demand analysis
[BNL-26045] N80-10633
Optimization of computer operating systems
[AD-A071463] N80-10834
CONTROL VALVES
Pressure and velocity response function measurements by the rotating valve method
N80-10312
CONTROLLERS
A method of computer-aided generation of software for digital system controllers using fixed-instruction machines
N80-10812
Issues in the digital implementation of control compensators
[NASA-CR-163416] N80-10814
CONVECTION
Stellar convection 2: A multi-mode numerical solution for convection in spheres
[NASA-CR-162252] N80-10979
Stellar convection 3: Convection at large Rayleigh numbers
[NASA-CR-162253] N80-10980
CONVECTIVE FLOW
Stellar convection 2: A multi-mode numerical solution for convection in spheres
[NASA-CR-162252] N80-10979
Stellar convection 3: Convection at large Rayleigh numbers
[NASA-CR-162253] N80-10980
CONVECTIVE HEAT TRANSFER
On the study of heat transfer with the aid of a local heat flux sensor
N80-10007

An investigation of the effects of internal solidification on turbulent-flow heat transfer and pressure drop in a horizontal tube — prediction analysis techniques for pressure reduction
N80-10456

CONVERGENCE
Convergence zone prediction models with programs for use on HP-67 and HP-97 programmable calculators
[AD-A072059] N80-10009
On rates of convergence in the L2 sense of nonparametric probability density estimates
[AD-A072134] N80-10040
Convergence rate for the mean integrated squared errors of some nonparametric density estimators of recursive delta-function type
[AD-A072133] N80-10049
A variation on Scheffe's theorem with application to nonparametric density estimation
[AD-A072132] N80-10050

CONVERGENT NOZZLES
Correlation of experimental data on two-phase-flow heat transfer in convergent part of a nozzle
N80-10021

CONVOLUTION INTEGRALS
Design of a quick-look decoder for the DSN [7,1/2] convolutional code — Galileo Project
N80-10253
Analysis and computational fitting of the lineshape of the NMR powder pattern
[IS-4516] N80-10874

COOLING
Cost-effective control systems for solar heating and cooling applications
[SAN-1592-1] N80-10658

COOLING SYSTEMS
Study of combined operation of self-evacuating vortex tube with diffuser
N80-10085
Development of a high temperature solar powered water chiller. Volume 3: Phase I
[SAN-1590-1/3-VOL-3] N80-10654

COORDINATES
Acceleration of transonic potentials flow calculations on arbitrary meshes by the multiple grid method
[AD-A072301] N80-10142

COPOLYMERS
New binder system for composite solid propellants — carboxyl terminated polybutadiene acrylonitrile liquid copolymer
N80-10398
Investigation of the T sub g [T sub g] reduction of homopolymers and block copolymers of styrene by torsional braid analysis
[AD-A072075] N80-10363
Flammability and thermal stability of polyphosphazenes copolymers, part I
[AD-A072114] N80-10366

COPPER
The effect of point contact surface damage on the work hardening of copper crystals
N80-10339
Stresses in sputter deposited Nickel and Copper oxide thin films
[SAND-79-0845C] N80-10351
Electrochemical copper coatings for surface finishing of hf resonators
[LA-TR-79-10] N80-10352

COPPER OXIDES
Stresses in sputter deposited Nickel and Copper oxide thin films
[SAND-79-0845C] N80-10351

CORAL REEFS
Metabolic responses of shallow tropical benthic microcosm communities to perturbation
[PB-298243/7] N80-10744

CORN
The biological conversion of corn residue into ethyl alcohol using an immobilized-cell reactor
N80-10376

CORNER FLOW
An investigation of corner separation within a thrust augmenter having Coanda jets
[NADC-76153-30] N80-10122

CORRECTION
Refraction corrections for surveying
[NASA-TM-80803] N80-10987

CORRELATION COEFFICIENTS
Bivariate distributions with given marginals and fixed measures of dependence
[LA-7700-MS] N80-10851

CORROSION
Fracture mechanics and surface chemistry studies of fatigue crack growth in an aluminum alloy
[AD-A071438] N80-10519

CORROSION PREVENTION
The development of Antiguard, a clear, water displacing, corrosion preventive compound
[AD-A071617] N80-10347

COSMONAUTS
Health prognosis in flight discussed
N80-10995

COSMOS 782 SATELLITE
The effect of dynamic factors of space flight on animal organisms
[NASA-TM-75692] N80-10745

COST ANALYSIS
Deep space network feasibility study of terminating Southern California Edison electrical service to Goldstone — cost analysis of electric power supplies and waste energy utilization
N80-10263
Oversight: Space shuttle cost, performance, and schedule review
[GPO-30-365] N80-10274

COST EFFECTIVENESS
Cost-effective control systems for solar heating and cooling applications
[SAN-1592-1] N80-10658
The economic impact of proposed regulations to reduce particulate emissions from steel mills and industrial fugitive sources, R-79-11
[PB-296527/5] N80-10705
Sierra cooperative pilot project, field
[PB-297065/5] N80-10741
A study of the cost-effective markets for new technology agricultural aircraft
[NASA-CR-159090] N80-10962

COST ESTIMATES
Computer software to calculate and map geologic parameters required in estimating coal production costs
[EPRI-EA-674] N80-10584

COSTS
Minimum cost transmitter-receiver antenna pairs — antenna design for the satellite solar power station using optimal control theory
[RM-690] N80-10414

COVARIANCE
Generating covariance sequences and the calculation of quantization and rounding error variances in digital filters
[AD-A072077] N80-10838

CRACK PROPAGATION
Fatigue crack propagation in high alloy and corrosion resistant [stainless] steel plate, bar and forgings
[ESDU-79003] N80-10341
Quasi-static crack growth in metals at elevated temperature, a review
[AD-A072347] N80-10348
Fatigue and corrosion fatigue of HY-80 steel, as applicable to anchor bolt failures
[AD-A072067] N80-10350
A new method of electric measurement of crack length
[RAE-TRANS-2016] N80-10517
Fracture mechanics and surface chemistry studies of fatigue crack growth in an aluminum alloy
[AD-A071438] N80-10519

CRACKS
Mathematical analysis of stress cracks volume 2. A bibliography with abstracts
[NTIS/PS-79/0803/1] N80-10530
Mathematical analysis of stress cracks, volume 3. A bibliography with abstracts
[NTIS/PS-79/0804/9] N80-10531

CRANIUM
Possibility of using bone conduction in aviation radio communication — cranial bone transducers
N80-10755

CRASHES
Light airplane crash tests at three roll angles
[NASA-TP-1477] N80-10512

CREEP ANALYSIS
Creep analysis of thin-wall structures subject to transient heating and loading
N80-10052
Creep and recovery of amorphous polymers — polymer physics and creep analysis applied to amorphous materials and polycarbonates to discover creep properties
N80-10359
An incremental form of the single-integral nonlinear viscoelastic theory for elastic-plastic-creep finite element analysis
[AD-A072151] N80-10523
Materials testing for central receiver solar-thermal power systems
[DOE/TIC-10103] N80-10686

CREEP BUCKLING
Influence of initial deflections on buckling of cylindrical shells under creep conditions with combined action of axial compression and internal pressure
N80-10039

CREEP PROPERTIES
Creep analysis of thin-wall structures subject to transient heating and loading
N80-10052
Creep behavior of Hastelloy X, 21/4 Cr-1 Mo steel, and other alloys in simulated HTGR helium
[ORNL/TM-6822] N80-10357
Creep and recovery of amorphous polymers — polymer physics and creep analysis applied to amorphous materials and polycarbonates to discover creep properties
N80-10359

CREEP RUPTURE STRENGTH
Improving the stress rupture and creep of silicon nitride — turbine materials
[NASA-CR-159585] N80-10318

CREEP TESTS
Materials testing for central receiver solar-thermal power systems
[DOE/TIC-10103] N80-10686

CROP VIGOR
Lodging of grain crops and its detection by aerial photography
N80-10994

CROSS FLOW
Influence of gas turbine engine combustion chambers geometric parameters on mixture formation characteristics
N80-10006
Cross flow fan experiment development and finite element modeling
N80-10098
A computational model for three-dimensional incompressible wall jets with large cross flow
N80-10115
Aluminum combustion under rocket motor conditions
N80-10294
Evaluation of the passive remote crosswind sensor — detecting the movement of atmospheric scintillations
[AD-A071176] N80-10730

CRUDE OIL
Alternative jet aircraft fuels
N80-10209

CRUISE MISSILES
Advanced missile technology. A review of technology improvement areas for cruise missiles — including missile design, missile configurations, and aerodynamic characteristics
[NASA-CR-3187] N80-10103

CRYOGENIC WIND TUNNELS
Cryogenic wind tunnel activities at the University of Southampton — flow visualization technique for low speed wind tunnel tests
[NASA-CR-159144] N80-10231

CRYSTAL DISLOCATIONS
Electron-dislocation interaction at low temperatures — metal crystals and superconductivity
[COO-2305-6] N80-10943

CRYSTAL GROWTH
Silicon ingot casting heat exchanger method, multi-wire slicing, fixed abrasive slicing technique, phase 3
[NASA-CR-162398] N80-10398

CRYSTAL OPTICS
Liquid crystals, volume 1. A bibliography with abstracts
[NTIS/PS-79/0795/9] N80-10947
Liquid crystals, volume 2. A bibliography with abstracts
[NTIS/PS-79/0796/7] N80-10948

CRYSTAL STRUCTURE
Nickel boron hybrid clusters: Synthesis of polyhedral nickelaboranes and nickelacarboranes from small borane and carborane anion. Crystal structure of [eta5-C5H5)4Ni4B4H4
[AD-A070926] N80-10345
Modulated structures in inorganic one-dimensional metals — tetracyanoplatinate and bisoxalatoplatinate
[CONF-790341-7] N80-10353
Effects of stoichiometry and neutron irradiation in superconducting A-15 compounds
[BNL-25940] N80-10944
Structure solution methods for superstructures
[CONF-790342-1] N80-10945
Liquid crystals, volume 1. A bibliography with abstracts
[NTIS/PS-79/0795/9] N80-10947
Liquid crystals, volume 2. A bibliography with abstracts
[NTIS/PS-79/0796/7] N80-10948

CRYSTAL SURFACES
The effect of point contact surface damage on the work hardening of copper crystals
N80-10339

CURVATURE
Experimental study of curvilinear surface film cooling effectiveness — film cooling of curvature flat surface turbine blades
N80-10026

CYANO COMPOUNDS
Modulated structures in inorganic one-dimensional metals — tetracyanoplatinate and bisoxalatoplatinate
[CONF-790341-7] N80-10353

CYCLOBUTANE
Transients in vibrational relaxation of polyatomic molecules at high temperatures by the variable exposure method
[AD-A070774] N80-10867

CYCLOTRON RESONANCE DEVICES
A point design for a gyrotron traveling wave tube amplifier
N80-10246

CYLINDRICAL BODIES
Theory of dielectric-filled edge-slot antennas
[AD-A071843] N80-10418
Analytical solutions for heat conduction in anisotropic media homogeneous in cylindrical coordinates at rest and in motion
N80-10452

Heat transfer into the infinite region external to a cylinder
[SAND-78-1942] N80-10466
CYLINDRICAL SHELLS
Influence of initial deflections on buckling of cylindrical shells under creep conditions with combined action of axial compression and internal pressure
N80-10039
Coincidence of higher-order modes: A mechanism of the excitation of cylindrical shell vibrations via internal sound
N80-10510
CYTOLOGY
Scalar diffraction analysis of light scattering by epithelial cells from a line focused laser beam
N80-10484

D

DAMPING
Study of periodic motions of a satellite with a magnetic damper
[NASA-TM-75667] N80-10273
The role of particulate damping in the control of combustion instability by aluminum combustion
N80-10296
DARKNESS
Quantum electrodynamics and light rays
[ORO-3992-354] N80-10949
DATA ACQUISITION
Network functions and facilities
N80-10241
The 19304D GSRS missile number 1026, round number v-25
[AD-A071425] N80-10720
The 19702A GSRS, missile number 087, round number B-11
[AD-A070549] N80-10726
Meteorological data analysis in support of the ABRES Program
[AD-A070946] N80-10729
Aircraft measurements of micrometeorological parameters at Panama City, Florida, in 1978
[AD-A079956] N80-10737
DATA BASES
Strip trees: A hierarchical representation for map features
[AD-A071124] N80-10582
Computer mapping software and geographic data base development: Oak Ridge National Laboratory user experience
[CONF-780727-1] N80-10586
Energy information data base. Corporate author entries
[DOE/TIC-4585-R1-SUPPL-1] N80-10647
Sensitivity study of CFAS and CFAR objective analysis techniques
[AD-A071452] N80-10734
Meteorological data bases available for the United States Department of Energy Oak Ridge Reservation
[ORNL/TM-6358] N80-10739
A system for control structure implementation for image understanding
[AD-A071603] N80-10805
Deductive planning and pathfinding for relational data bases
[AD-A070001] N80-10957
Summary of the Sandia Materials Information data bank — materials aging and compatibility data
[SAND-78-1961C] N80-10959
DATA LINKS
Integration developments
N80-10188
DSN tracking system uplink frequency control
N80-10255
DATA MANAGEMENT
Proceedings of the Third Berkeley Workshop on distributed data management and computer networks
[LBL-7953] N80-10831
DATA PROCESSING
Performance enhancement of the GPS receiver by data-free operation
N80-10172
Video control center and cockpit simulator
[AD-A071313] N80-10234
On the consistency of the maximum likelyhood estimate of normal mixture parameters for a sample with field structure
[NASA-CR-160352] N80-10836
DATA PROCESSING EQUIPMENT
Phase 2 GPS receiver design philosophy
N80-10171
Special purpose computer to computer interface
[ES-T-830] N80-10811
DATA PROCESSING TERMINALS
Design considerations for the man-machine solutions user interface to TAS
[AD-A071207] N80-10802
DATA RECORDING
Experimental study of the vidicon system for information recording using the wide-gap spark chamber of gamma - telescope gamma-1
[NASA-TM-75644] N80-10478
DATA REDUCTION
Performance enhancement of the GPS receiver by data-free operation
N80-10172
X-band sampling by the occultation data assembly
N80-10264
Electronic reduction of high speed mass spectral data
[SAND-79-0709] N80-10736
Cluster analysis based on density estimates and its application to landsat imagery
N80-10533
On the consistency of the maximum likelyhood estimate of normal mixture parameters for a sample with field structure
[NASA-CR-160352] N80-10836
DATA SAMPLING
X-band sampling by the occultation data assembly
N80-10264
DATA STORAGE
Manual of documentation practices applicable to defence-aerospace scientific and technical information, volume 2
[AGARD-AG-235-VOL-2] N80-10961
DATA SYSTEMS
National library of medicine toxicology data base management system
[ORNL/CSD/TM-40] N80-10785
DATA TRANSMISSION
The deep space network
[NASA-CR-162414] N80-10240
A voltage-controlled optical radio frequency-phase shifter
N80-10245
Fiber optic utilization at the Nevada Test Site — radiation effects on underground cables for analog data transmission
[LA-7029-MS] N80-10912
DECELERATION
Experimental study of turbulence energy balance components in the suction of a retarded turbulent boundary layer
N80-10019
Parachute-rocket deceleration system design
N80-10059
Development and testing of a three-stage double tandem accelerator-decelerator system for low energy, highly stripped ions
[COO-4257-3] N80-10878
DECISION MAKING
Satellite Power System (SPS) preliminary societal assessment
[HCP/R4024-01/14] N80-10657
Life stress, self-preoccupation, and social supports
[AD-A068624] N80-10789
Decision making, fuzzy set theory and computers
[AD-A071842] N80-10815
The requirements and feasibility of business planning in the office of space and terrestrial applications
[NASA-CR-162388] N80-10852
Managerial plus: Executive order 12003 and the National Energy Act
[DOE/TIC-10067] N80-10965
DECISION THEORY
A memory retrieval aid for hypothesis generation
[AD-A072657] N80-10795
DECODERS
Design of a quick-look decoder for the DSN [7,1/2] convolutional code — Galileo Project
N80-10253
DECODING
A Reed-Solomon decoding program for correcting both errors and erasures
N80-10254
DECOMPRESSION SICKNESS
Course of altitude caisson disease in dogs exposed to accelerations
N80-10773
DEEP SPACE NETWORK
The deep space network
[NASA-CR-162414] N80-10240
Network functions and facilities
N80-10241
Voyager support
N80-10242
Pioneer 11 saturn encounter support
N80-10243
Radio astronomy
N80-10244
Demonstration of remote clock monitoring by VLBI, with three baseline closure
N80-10247
Projected state-of-the-art for frequency standards for the DSN in the 1982 - 1990 time frame
N80-10248
The R sub 0 parameter for optical communication using photon counting
N80-10249
Density and reliability predictions for a general logic structure for custom LSI
N80-10250
Frequency down-converters as applied to VLBI
N80-10251
The NOCC radio science subsystem: System performance validation for the DSN radio science and Very Long Baseline Interferometry (VLBI) systems
N80-10252
Design of a quick-look decoder for the DSN [7,1/2] convolutional code — Galileo Project
N80-10253
A Reed-Solomon decoding program for correcting both errors and erasures
N80-10254
DSN tracking system uplink frequency control
N80-10255
DSN CONSCAN: A vector nomenclature and method for determining parameter values
N80-10256
Radio frequency performance of DSS 14 64-m antenna at X-band using a dual hybrid mode feed
N80-10258
Deep space network feasibility study of terminating Southern California Edison electrical service to Goldstone — cost analysis of electric power supplies and waste energy utilization
N80-10263
DELAY LINES
Interaction of surface waves with thin nickel films
N80-10931
DELTA WINGS
Flow-around small-aspect-ratio delta wing with vortex "bursting"
N80-10060
DELTAS
Detection of a probable ancestral delta of the Nile River
N80-10571
Suspended-sediment dispersal patterns of river deltas photographed by ASTP
N80-10572
DEMAND [ECONOMICS]
Cargo Logistics Airlift Systems Study (CLASS). Volume 4: Future requirements of dedicated freighter aircraft to year 2000
[NASA-CR-158950-VOL-4] N80-10149
Economic structure, aggregate production functions and the demand for energy as an intermediate product: A preliminary analysis
[DOE/EIA-0103/8] N80-10607
Energy supply and demand in the midterm: 1985, 1990, and 1995
[DOE/EIA-0102/52] N80-10630
DEMODULATORS
Self-calibrating threshold detector — signal detectors for use with receivers using a demodulator for signal encoding
[NASA-CASE-MSC-16370-1] N80-10413
DENMARK
Standards system in Canada, the UK, West Germany, and Denmark: An overview
[PB-296912/9] N80-10407
DENSE PLASMAS
High temperature science: Future needs and anticipated development in high-density shock-wave research
[UCID-18072] N80-10877
Electron transfer in a superdense nondegenerate plasma
[UCRL-TRANS-11473] N80-10924
DENSITY (MASS/VOLUME)
Density and reliability predictions for a general logic structure for custom LSI
N80-10250
Studies on the mixing in a density-stratified shear flow
N80-10454
Dependence of conduction band energy and electron mobility on fluid density
[BNL-26072] N80-10941
DEOXYRIBONUCLEIC ACID
Effect of space flight conditions on deoxyribonucleoprotein and nucleic acid content of rat tissues
N80-10760
DEPOLARIZATION
Studies of the abnormally high peak voltage observed with FeS2 depolarized thermal batteries
[SAND-79-0090] N80-10641
DEPOSITION
Mechanism of turbine engine lubricant deposition
[AD-A072557] N80-10223
DESERTS
Structural pattern of the northern part of the eastern desert of Egypt
N80-10545
Photolineaments in the ASTP stereostrip of the western desert of Egypt
N80-10546
Utilization of ASTP photographs in the study of small structures in Abu Rawash and Wadi el Natrun, Egypt
N80-10547
Color of desert surfaces in the Arabian peninsula
N80-10558
Monte Desert of San Juan, Argentina, as photographed by ASTP
N80-10559

Dunes and other windforms of central Australia, and a comparison with linear dunes on the Moenkopi Plateau, Arizona
N80-10560

DESIGN ANALYSIS
Plano 2 GPS receiver design philosophy
N80-10171
A study to develop optimization algorithms for aircraft wing structures
[AD-A072068] N80-10196
Design criteria for dry lubricated flight control bearings — wear tests to make design analysis and check equipment specifications
[AD-A071322] N80-10228
MDAC/Rockedyne solar receiver: Design review
[SAND-78-8188] N80-10616
Battery Energy Storage Test [BEST] facility
[EPRI-EM-1005] N80-10628

DESORPTION
Heat of vaporization spectrometer
[BNL-24973] N80-10480

DESULFURIZING
Continuous coal processing method and means
[NASA-CASE-NPO-13738-2] N80-10377

DEUTERIUM
Production of hydrogen, deuterium, and helium by 15-MeV neutrons
[COO-2719-5] N80-10873

DEUTERONS
Proton deuteron elastic scattering from 20 to 220 GeV/c
N80-10863

DICTIONARIES
Lexicon of aircraft transparency terms
[AD-A071319] N80-10200

DIELECTRICS
Theory of dielectric-filled edge-slot antennas
[AD-A071843] N80-10418

DIESEL ENGINES
Emission assessment of conventional stationary combustion systems. Volume 2: Internal combustion sources
[PB-296390/0] N80-10606

DIESEL FUELS
Dynamics of diesel fuel combustion in turbulent flow
N80-10874

DIFFERENTIAL EQUATIONS
Lyapunov stability and its application to systems of ordinary differential equations
[NASA-TM-80806] N80-10835

DIFFERENTIAL GEOMETRY
Refraction corrections for surveying
[NASA-TM-80803] N80-10907

DIFFRACTION
Diffraction measurements for LASL's Antares laser system
[LA-7943-MS] N80-10492
Serrated apertures: Statistical diffraction theory and experiments
N80-10902
Quantum electrodynamics and light rays
[ORO-3992-354] N80-10949

DIFFRACTION PATTERNS
Scalar diffraction analysis of light scattering by epithelial cells from a line focused laser beam
N80-10484
Structure solution methods for superstructures
[CONF-790342-1] N80-10945

DIFFUSERS
Study of combined operation of self-evacuating vortex tube with diffuser
N80-10885

DIFFUSION
Minority carrier lifetime and diffusion length in P-type mercury cadmium telluride
[AD-A071094] N80-10934

DIFFUSION COEFFICIENT
Hydrogen diffusion and trapping in bcc and fcc metals
[BNL-26132] N80-10336
A perspective of a workshop on stability of thin film solar cells and materials
[PB-297396/4] N80-10676

DIGITAL COMPUTERS
Decision making, fuzzy set theory and computers
[AD-A071842] N80-10815
MATE support software analysis
[AD-A070931] N80-10824

DIGITAL FILTERS
An improvement in Fourier transform accuracy — statistical analysis of fourier transformation algorithms when seeking a single frequency
N80-10261
Generating covariance sequences and the calculation of quantization and rounding error variances in digital filters
[AD-A072077] N80-10838

DIGITAL SIMULATION
Math modeling and computer mechanization for real time simulation of rotary-wing aircraft
[NASA-CR-162400] N80-10137

DIGITAL SYSTEMS
Multivariable digital control systems
[AD-A071662] N80-10236
Frequency down-converters as applied to VLBI
N80-10251
Digital PSK to BIO-L demodulator for 2 sup n/bit rate] carrier
[NASA-TM-80159] N80-10433
A method of computer-aided generation of software for digital system controllers using fixed-instruction machines
N80-10812
Issues in the digital implementation of control compensators
[NASA-CR-162416] N80-10814

DIGITAL TECHNIQUES
Digital reconstruction of acoustic holograms
N80-10475
X-ray tomography by optical reconstruction from projections
N80-10903

DIODES
Emittance measurements on field emitter diodes
[UCRL-82533] N80-10440

DIRECTIONAL ANTENNAS
Radio astronomy
N80-10244
Antenna azimuth bearing model experiment
N80-10257
An experimental investigation of the effects of antenna pointing errors on range delays — error analysis of range errors in directional antennas due to time lag
N80-10259
Electromagnetic fields of underground antennas — electromagnetic properties of directional antennas in electric fields and magnetic fields
N80-10412

DIRECTIONAL CONTROL
DSN CONSCAN: A vector nomenclature and method for determining parameter values
N80-10256

DISKS [SHAPES]
Computer calculation of stationary temperature fields in cooled turbine discs
N80-10869

DISPLAY DEVICES
Video control center and cockpit simulator
[AD-A071313] N80-10234
Quasi-three-dimensional display of infrared radar images using range/intensity color mapping
[AD-A070671] N80-10417

DISTILLATION
Preprototype vapor compression distillation subsystem — recovering potable water from wastewater
[NASA-CR-160332] N80-10881

DISTORTION
Use of predistortion to reduce intermodulation distortion in optical fiber communication sources
[AD-A072637] N80-10910

DISTRIBUTED PARAMETER SYSTEMS
Variable sample time algorithms for microcomputer control of distributed parameter systems
N80-10450
Optimal control of distributed parameter systems for solar thermal applications
N80-10593

DISTRIBUTION FUNCTIONS
Multipion production in nuclear collisions — distribution functions and particle production in particle collisions and nucleon-nucleon scattering
[LBL-8758] N80-10894

DISTRIBUTORS
Pneumatic distributor for turbojet engine control system — TU-154 aircraft
N80-10091

DOGS
Ultrastructural changes in canine hepatocytes during continuous chronic exposure to low doses of gamma radiation
N80-10768

DOPPLER EFFECT
Principle of operation of NAVSTAR and system characteristics
N80-10158

DOPPLER RADAR
Sierra cooperative pilot project, field
[PB-297065/5] N80-10741

DOUBLE BASE ROCKET PROPELLANTS
The ageing behaviour of solid rocket propellants regarding their mechanical properties
N80-10299
Improving the all weather ballistic and mechanical properties of smokeless propergols
N80-10300
Low frequency oscillatory combustion: Experiments and results
N80-10305

DRAG REDUCTION
Effect of winglets on a first-generation jet transport wing. 6: Stability characteristics for a full-span model at subsonic speeds — conducted in Langley 8 foot transonic pressure tunnel
[NASA-TP-1330] N80-10101
Effect of several airframe/nozzle modifications on the drag of a variable-sweep bomber configuration — conducted in langley 16 foot transonic tunnel
[NASA-TM-80129] N80-10106

DRONE AIRCRAFT
Study of the feasibility aspects of flight testing an aeroelastically tailored forward swept research wing on a BQM-34F drone vehicle
[NASA-CR-159149] N80-10195

DROP SIZE
Study of size distribution of oil drops formed in GTE oil
N80-10888
Mass transfer and liquid-liquid dispersion in agitated vessels — mass transfer coefficients and drop size in soluble liquid-liquid interfaces after mixing
N80-10449
Spray nozzle designs for agricultural aviation applications — relation of drop size to spray characteristics and nozzle efficiency
[NASA-CR-159702] N80-10460

DRYING
The development of Amlguard, a clear, water displacing, corrosion preventive compound
[AD-A071617] N80-10347
Application of microwave energy to post-calcination treatment of high-level nuclear wastes — pellet drying and glass vitrification
[ICP-1183] N80-10889

DRYING APPARATUS
Microwave heating: Applications and equipment. Citations from NTIS data base
[NTIS/PS-79/0631/6] N80-10673
Microwave heating: Industrial applications. Citations from the engineering data base
[NTIS/PS-79/0632/4] N80-10674

DUCTED FAN ENGINES
Aero-acoustic tests of duct-burning turbofan exhaust nozzles
[NASA-CR-162254] N80-10204

DUCTED FANS
Cross flow fan experiment development and finite element modeling
N80-10898

DUCTED FLOW
A two-dimensional model of the interaction of a transverse jet in a supersonic stream with application to supersonic combustion
N80-10328

DUCTILITY
Ductility in bending of molybdenum alloys irradiated between 425 and 1000C
[CONF-790125-53] N80-10334
Computer model for ductile fracture — nuclear reactor pressure vessels
[UCID-18070] N80-10326

DUNES
Dunes and other windforms of central Australia, and a comparison with linear dunes on the Moenkopi Plateau, Arizona
N80-10560

DYNAMIC CHARACTERISTICS
Dynamic characteristics of liquid film in hybrid hydrostatic bearing
N80-10005
Recent research in composite and sandwich plate dynamics
[AD-A072277] N80-10322

DYNAMIC MODELS
Two-dimensional nonstationary model of the propagation of an electron beam in a vacuum
[NASA-TM-75693] N80-10435

DYNAMIC RESPONSE
Flying qualities research for highly augmented aircraft
[RE-582] N80-10194
Theory of dielectric-filled edge-slot antennas
[AD-A071843] N80-10418
Dynamic response of a slab of elastic-viscoplastic material that exhibits induced plastic anisotropy
[ISSN-0072-9310] N80-10513
Vibration frequencies of an arch model under various loading conditions
[PB-297987/0] N80-10529

E

EARTH [PLANET]
Excitation of currents on infinite wires by vertical and horizontal electric dipoles in the presence of a dissipative Earth
N80-10430
Ion acceleration at the earth's bow shock: A review of observations in the upstream region
[LA-UR-79-309] N80-10984

EARTH ATMOSPHERE
Study to analyze and synthesize satellite data
[AD-A070947] N80-10712

EARTH ENVIRONMENT
General-purpose heat source project, space nuclear safety program, and radioisotopic terrestrial safety program
[LA-7560-PR] N80-10886

EARTH OBSERVATIONS [FROM SPACE]
Apollo-Soyuz test project. Volume 2: Earth observations and photography
[NASA-SP-412-VOL-2] N80-10538

Summary of significant results
N80-10539
Geologic analysis of ASTP photographs of parts of southern California
N80-10540
Utilization of ASTP photographs in the study of small structures in Abu Rawash and Wadi el Natrun, Egypt
N80-10547
Volcanic landforms and astroblemes
N80-10551
Antipodal seas — astronaut observation of ocean features
N80-10564
Ocean color observations — by astronauts
N80-10566
Comparison of astronaut visual color observations with ASTP photographs
N80-10577
Film selection for the earth observations and photography experiment
N80-10578
Photogrammetric analysis of ASTP earth observations experiment data
N80-10581
LANDSAT project, State of Hawaii: A preliminary report
[PB-296712/3]
N80-10587
The requirements and feasibility of business planning in the office of space and terrestrial applications
[NASA-CR-162388]
N80-10852

EARTH RESOURCES
Educator's guide for Mission to Earth: LANDSAT views the world
[NASA-SP-360]
N80-10537

EARTH RESOURCES PROGRAM
Remote sensing applied to agricultural resources. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0733/0]
N80-10588

EARTHQUAKES
Variation of seismic source parameters and stress drop within a descending slab as revealed from body-wave pulse-width and amplitude analysis, part 1. A seismological investigation of the subduction mechanism of aseismic ridges, part 2
N80-10710
Source and propagation effects of Rayleigh waves from central Asian earthquakes — and the geological structure of New England
[AD-A070241]
N80-10714

ECHOES
Theory of phonon echoes in insulators — time functions of sound waves
N80-10858

ECONOMETRICS
The jet membrane process for uranium separation and enrichment
[RE-586]
N80-10329
Computer software to calculate and map geologic parameters required in estimating coal production costs
[EPRI-EA-674]
N80-10584

ECONOMIC ANALYSIS
Coal conversion processes and analysis methodologies for synthetic fuels production -- technology assessment and economic analysis of reactor design for coal gasification
[NASA-CR-161322]
N80-10379
Energy and economic assessment of anaerobic digesters and biofuels for rural waste management
[PB-296523/4]
N80-10398
Economic structure, aggregate production functions and the demand for energy as an intermediate product: A preliminary analysis
[DOE/EIA-0103/8]
N80-10607
Economic performance of passive solar heating: A preliminary analysis
[LA-UR-78-2861]
N80-10645
Geothermal resources and technology in the United States
[PB-296823/2]
N80-10677
Sensitivity analysis of optimal linear random parameter systems
[AD-A071091]
N80-10963

ECONOMIC FACTORS
Cargo Logistics Airlift Systems Study (CLASS). Volume 4: Future requirements of dedicated freighter aircraft to year 2000
[NASA-CR-158950-VOL-4]
N80-10149
Satellite direct broadcasting: The prospects for development — economic factors of satellite transmissions for direct broadcasting of television
N80-10410
Socioeconomic data requirements for environmental assessment: Coal gasification and liquefaction projects
[CONF-780843-5]
N80-10693

ECONOMIC IMPACT
The economic impact of proposed regulations to reduce particulate emissions from steel mills and industrial fugitive sources, R78-11
[PB-296527/5]
N80-10705

ECONOMICS
National energy plan 2
[DOE/TIC-10109]
N80-10618

ECONOMY
Energy conservation and the environment: conflict or complement
[LBL-7882]
N80-10621

EDDY CURRENTS
Transient eddy currents on finite plane and toroidal conducting surfaces
[PPPL-1517]
N80-10444

EDUCATION
Educator's guide for Mission to Earth: LANDSAT views the world
[NASA-SP-360]
N80-10537

EFFICIENCY
Aerodynamic efficiency of gas turbine intake duct -- - for gas turbine power plants
N80-10077

EGYPT
Structural pattern of the northern part of the eastern desert of Egypt
N80-10545
Photolineaments in the ASTP stereostrip of the western desert of Egypt
N80-10546
Utilization of ASTP photographs in the study of small structures in Abu Rawash and Wadi el Natrun, Egypt
N80-10547
Color zoning in the western desert of Egypt
N80-10553
Orbital observations of sand distribution in the western desert of Egypt
N80-10554
Preliminary analysis of color variations of sand deposits in the western desert of Egypt
N80-10555
Detection of a probable ancestral delta of the Nile River
N80-10571

EIGENVALUES
Matrix inverse eigenvalue problem for periodic Jacobi Matrices
[STAN-CS-78-684]
N80-10855

EJECTORS
Liquid ejector with perforated nozzle
N80-10072
Workshop on Thrust Augmenting Ejectors
[NASA-CP-2093]
N80-10107
Recent developments in ejector technology in the Air Force: An overview
N80-10108
NASA overview
N80-10109
An overview of current Navy programs to develop thrust augmenting ejectors
N80-10110
Numerical prediction of 3-D ejector flows
N80-10111
Viscid/inviscid interaction analysis of thrust augmenting ejectors
N80-10112
Internal-external flow integration for a thin ejector-flapped wing section
N80-10113
On the rational design of compressible flow ejectors
N80-10114
Computer aided design study of hypermixing nozzles
N80-10116
Nonsteady-flow thrust augmenting ejectors
N80-10117
Integration of ejectors into high-speed aircraft — forebody effects
N80-10119
Some tests on small-scale rectangular thrust ejector — thrust augmentation for V/STOL aircraft
N80-10120
Augmenting ejector endwall effects — V/STOL aircraft
N80-10121
Entrainment characteristics of unsteady subsonic jets — for V/STOL aircraft
N80-10124
A simple apparatus for the experimental study of non-steady flow thrust-augmenter ejector configurations
N80-10125
Considerations of some critical ejector problems — for the V/STOL aircraft
N80-10127
Interface concerns of ejector integration in V/STOL aircraft
N80-10129
Reaction control system augmentation for V/STOL aircraft
N80-10130
Design and test of a prototype scale ejector wing
N80-10131
The external augmentor concept for V/STOL aircraft
N80-10132
The XFV-12A Thrust-Augmented Wing [TAW] prototype aircraft
N80-10133

ELASTIC DEFORMATION
The relationships of the process variables and material properties on clad-rolled metals
N80-10343
Study of a stereo electro-optical tracker system for the measurement of model deformations at the national transonic facility
[NASA-CR-159146]
N80-10476

ELASTIC PROPERTIES
Optimal control of flight vehicle with elastic elements
N80-10027
Theory of realizability for linearly elastic truss-structures and related applications in optimum structural design
N80-10589

ELASTIC SCATTERING
Proton deuteron elastic scattering from 20 to 220 GeV/c
N80-10863
Proton-helium elastic scattering from 40 to 400 GeV
[CONF-780826-9]
N80-10871
Intermediate energy, inelastic, and charge exchange nucleon-nucleus scattering
N80-10879
Experiments on the nuclear interactions of pions
[ORO-4043-38]
N80-10881

ELASTOMERS
Fluorodinitro silicon compounds and high energy elastomeric polymers
[AD-A072559]
N80-10367

ELECTRIC BATTERIES
Battery Energy Storage Test [BEST] facility
[EPRI-EM-1005]
N80-10628
Effect of mechanical energy storage systems on the characteristics of electric vehicles
[UCRL-82710]
N80-10664
Lead batteries, volume 2. Citations from the engineering index data base
[NTIS/PS-77/0634]
N80-10681

ELECTRIC CONDUCTORS
The noise properties of thick film resistors
N80-10428

ELECTRIC CONTACTS
Wear of modified electrical brush material in vacuum
[RAE-TRANS-2007]
N80-10436

ELECTRIC CURRENT
Excitation of currents on infinite wires by vertical and horizontal electric dipoles in the presence of a dissipative Earth
N80-10430

ELECTRIC DIPOLES
Excitation of currents on infinite wires by vertical and horizontal electric dipoles in the presence of a dissipative Earth
N80-10430

ELECTRIC EQUIPMENT
The potential of carbon fiber induced shock hazards in household toasters
[NASA-CR-159147]
N80-10434

ELECTRIC FIELDS
Electromagnetic fields of underground antennas — electromagnetic properties of directional antennas in electric fields and magnetic fields
N80-10412

ELECTRIC FILTERS
Design and evaluation of decentralized filters for large scale interconnected systems — systems engineering of electric and electronic filters for electronic equipment
N80-10425

ELECTRIC MOTOR VEHICLES
Effect of mechanical energy storage systems on the characteristics of electric vehicles
[UCRL-82710]
N80-10664

ELECTRIC MOTORS
Numerical simulation of dynamics of brushless dc motors for aerospace and other applications. Volume 1: Model development and applications, part A
[NASA-CR-160349]
N80-10437

ELECTRIC POTENTIAL
Propulsive nozzle electrification
N80-10049

ELECTRIC POWER
Applications survey: evaluation of gas turbine needs
[EPRI-AF-911]
N80-10498
EPRI new energy resources department strategy paper
[EPRI-ER-979]
N80-10610

ELECTRIC POWER PLANTS
Aerodynamic efficiency of gas turbine intake duct -- - for gas turbine power plants
N80-10077
NASA-Lewis closed-cycle magnetohydrodynamics plant analysis
[NASA-TM-79249]
N80-10395
The first small power system experiment, Phase I: Engineering experiment no. 1 — solar thermal electric power plants
[NASA-CR-162417]
N80-10596

Screening evaluation of novel power cycles integrated with gasification plants
[EPRI-AF-1002] N80-10605
Safety and environmental implications DOE/Sandia Midtemperature Solar Systems Test Facility
[SAND-78-2295C] N80-10609
Sensitivity study of Brayton cycle power plant performance
[SAND-78-8020] N80-10626
Geothermal resources and technology in the United States
[PB-296823/2] N80-10677
Compiling a multistate emissions inventory — fossil fuel electric power production
[BNL-23943] N80-10691

ELECTRIC POWER SUPPLIES
Deep space network feasibility study of terminating Southern California Edison electrical service to Goldstone — cost analysis of electric power supplies and waste energy utilization
N80-10263
Power supply requirements for a tokamak fusion reactor
[ANL/FPP/TM-119] N80-10918

ELECTRIC SPARKS
Electrical charging of fabric and film materials
N80-10048

ELECTRIC TERMINALS
A theory and an algorithm for analog circuit fault diagnosis
N80-10436

ELECTRIC WIRE
Excitation of currents on infinite wires by vertical and horizontal electric dipoles in the presence of a dissipative Earth
N80-10430

ELECTRICAL FAULTS
A theory and an algorithm for analog circuit fault diagnosis
N80-10436

ELECTRICAL GROUNDING
Implications of possible shuttle charging — prediction analysis techniques for insulation and electrical grounding against ionospheric conductivity
[NASA-CR-161283] N80-10277

ELECTRICAL MEASUREMENT
Electrical measurement of plating thickness
[BDX-613-1942-REV] N80-10442
A new method of electric measurement of crack length
[RAE-TRANS-2014] N80-10517

ELECTRICAL RESISTIVITY
Electrical charging of fabric and film materials
N80-10048

ELECTRO-OPTICS
Research investigation directed toward extending the useful range of the electromagnetic spectrum
[AD-A071464] N80-10421
Joint services electronics program — a bibliography with abstracts
[AD-A072076] N80-10438
Study of a stereo electro-optical tracker system for the measurement of model deformations at the national transonic facility
[NASA-CR-159146] N80-10476

ELECTROACOUSTIC TRANSDUCERS
Possibility of using bone conduction in aviation radio communication — cranial bone transducers
N80-10735

ELECTROCHEMISTRY
Electropolymerization in stationary cells and in packed and fluidized bed electrode cells
N80-10360
Novel duplex vapor: Electrochemical method for silicon solar cells — chemical reactor for a silicon sodium reaction system
[NASA-CR-162307] N80-10597

ELECTRODEPOSITION
Electrochemical copper coatings for surface finishing of hf resonators
[LA-TR-79-10] N80-10352
Dependence of fracture toughness of molybdenum inert welds on dendritic spacing and in situ titanium additions
[SAND-79-8193C] N80-10501

ELECTRODYNAMICS
Numerical modeling of stimulation of induced magnetosphere during interaction of solar wind with the ionosphere of Venus
[NASA-TM-75921] N80-10990

ELECTROHYDRODYNAMICS
An attempt to produce both thick and thinned flowing superfluid films. 1: A study of the feasibility of verifying Lifshitz's theory of Van der Waals force for a metallic surface. 2: The electrohydrodynamic instability of the super-thick helium film
N80-10932

ELECTROLYSIS
Hydrogen production. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0773/4] N80-10401

ELECTROLYTE METABOLISM
Effect of hypoxia on fluid-electrolyte metabolism and renal function in man as related to different degrees of motor activity
N80-10734

ELECTROMAGNETIC FIELDS
Electromagnetic fields of underground antennas — electromagnetic properties of directional antennas in electric fields and magnetic fields
N80-10412
Two-dimensional nonstationary model of the propagation of an electron beam in a vacuum
[NASA-TM-75693] N80-10435

ELECTROMAGNETIC INTERFERENCE
JTIDS: The issue of frequency selection — low frequency assignment for pulse communication navigation aids
N80-10183

ELECTROMAGNETIC NOISE
The noise properties of thick film resistors
N80-10428
Noise considerations in millimeter-wave spectrometers
[LBL-7294] N80-10483
Use of predistortion to reduce intermodulation distortion in optical fiber communication sources
[AD-A072637] N80-10910

ELECTROMAGNETIC PROPERTIES
Electromagnetic fields of underground antennas — electromagnetic properties of directional antennas in electric fields and magnetic fields
N80-10412
Production and detection of new neutrinos
[ORO-3992-346] N80-10882

ELECTROMAGNETIC SCATTERING
Swept frequency scattering measurements of aircraft — target identification
[AD-A071474] N80-10420
Electromagnetic scattering by a two-dimensional inhomogeneity due to an oscillating magnetic dipole
[LBL-8275] N80-10424

ELECTROMAGNETIC SPECTRA
Spectral radiometric measurement and analysis program. Volume 2: Description of the data collection program
[AD-A072079] N80-10731

ELECTROMAGNETISM
Electronics research in the Army
[AD-A071805] N80-10992

ELECTROMECHANICAL DEVICES
Electromechanical flight control actuator
[NASA-CR-160348] N80-10224

ELECTRON BOMBARDMENT
Electron excitation cross sections for multiply charged ions
[ORO-4881-23] N80-10868

ELECTRON DENSITY PROFILES
Two-dimensional nonstationary model of the propagation of an electron beam in a vacuum
[NASA-TM-75693] N80-10435

ELECTRON GUNS
High peak power pulsed WIP electron gun
[UCRL-13930] N80-10877

ELECTRON MOBILITY
Dependence of conduction band energy and electron mobility on fluid density
[BNL-26072] N80-10941

ELECTRON PRECIPITATION
A correlation between auroral kilometric radiation and inverted-V electron precipitation
[NASA-CR-162399] N80-10713

ELECTRON RADIATION
High energy electron radiation of wastewater liquid residuals
[PB-297593/6] N80-10976

ELECTRON SCATTERING
Electron-dislocation interaction at low temperatures — metal crystals and superconductivity
[COO-2205-6] N80-10943

ELECTRON SPIN
Modified method of perturbed stationary states 1
[SAND-78-0235] N80-10893

ELECTRON TRANSFER
Chemiluminescence of diphenyl peroxide. Pulsed laser spectrophotometric detection of radical ion intermediates on the CIEEL path
[AD-A071151] N80-10486
Theory of electron transfer and ionization
[CONF-790438-1] N80-10876

ELECTRONIC CONTROL
Numerical simulation of dynamics of brushless dc motors for aerospace and other applications. Volume 1: Model development and applications, part A
[NASA-CR-160349] N80-10437

ELECTRONIC EQUIPMENT
Design and evaluation of decentralized filters for large scale interconnected systems — systems engineering of electric and electronic filters for electronic equipment
N80-10425

ELECTRONIC FILTERS
Design and evaluation of decentralized filters for large scale interconnected systems — systems engineering of electric and electronic filters for electronic equipment
N80-10425

ELECTRONS
Experimental review of beam polarization in high energy positron electron storage rings
[SLAC-PUB-2258] N80-10896

ELECTROPHORESIS
Feasibility of commercial space manufacturing, production of pharmaceuticals. Volume 1: Executive summary
[NASA-CR-161324] N80-10265
Feasibility of commercial space manufacturing, production of pharmaceuticals. Volume 2: Technical analysis
[NASA-CR-161325] N80-10267
Feasibility of commercial space manufacturing, production of pharmaceuticals. Volume 3: Product data
[NASA-CR-161326] N80-10268
Kidney cell electrophoresis
[NASA-CR-160353] N80-10782

ELECTROPHYSICS
Electronic characteristics of 3 - 5 compounds — electrophysics study of atomic structures of gallium arsenides and indium phosphides
[AD-A071447] N80-10939

ELEMENTARY PARTICLES
Impact of storage rings on elementary particle physics
[LBL-8908] N80-10869

EMITTANCE
Emittance measurements on field emitter diodes
[UCRL-82533] N80-10440

ENCAPSULATING
Immobilization of hazardous residuals by encapsulation — using a polyester matrix
[PB-296642/2] N80-10897

ENERGY CONSERVATION
Aircraft Energy Efficiency [ACEE] status report
N80-10296
Thermal and lighting efficiency standards
[PB-297429/3] N80-10408
Another look at energy conservation
[LBL-7893] N80-10611
Energy conservation and the environment: conflict or complement
[LBL-7882] N80-10621
Department of Energy workshops on industrial energy conservation reporting
[DOE/CS-1830-T3] N80-10635
Aircraft fuel. Citations from the International Aerospace Abstracts Data Base
[NTIS/PS-79/0764/5] N80-10668
Energy saving strategies for federal procurement
[PB-296969/9] N80-10678

ENERGY CONSUMPTION
The building loads analysis and system thermodynamics blast program. Version 2.0: users manual, volume 2
[AD-A072273] N80-10404
Another look at energy conservation
[LBL-7893] N80-10611
National energy plan 2
[DOE/TIC-10109] N80-10618
Energy transition in California
[UCRL-15083] N80-10619
Energy supply and demand in the midterm: 1985, 1990, and 1995
[DOE/EIA-0102/52] N80-10620

ENERGY CONVERSION
Coal conversion systems: Technical data book
[HCP/T2286-01] N80-10392
Growing energy: Land for biomass farms
[PB-296650/5] N80-10400
Modeling approach suitable for energy system
[CONF-790459-4] N80-10632
Dynamics and control: Energy conversion, delivery, and demand analysis
[BNL-26045] N80-10633
Effect of mechanical energy storage systems on the characteristics of electric vehicles
[UCRL-82710] N80-10664
Waste Heat Utilization: Proceedings of 1978 Engineering Foundation Conference
[CONF-7808102] N80-10665

ENERGY CONVERSION EFFICIENCY
NASA-Lewis closed-cycle magnetohydrodynamics plant analysis
[NASA-TM-79249] N80-10595
Sensitivity study of Brayton cycle power plant performance
[SAND-78-8020] N80-10626

ENERGY DISTRIBUTION
Experimental study of turbulence energy balance components in the section of a retarded turbulent boundary layer
N80-10819

ENERGY LEVELS
Electron excitation cross sections for multiply charged ions
[ORO-4881-23] N80-10868
Analytic coherent states for generalized potentials -- motion of a classical particle
[LA-UR-79-218] N80-10951

ENERGY POLICY
Applications analysis of fixed site hydrogen storage
(SAND-78-8272) N80-10384
Research guidance studies to assess gasoline from coal by methanol-to-gasoline and zeosil-type Fischer-Tropsch technologies
(FE-2447-13) N80-10388
Near term potential of wood as a fuel
(HCP/C4101) N80-10389
Sugar crops as a source of fuels. Volume 1: Agricultural research
(TID-29450/1) N80-10395
Biomass energy enhancement: A report to the President's Council on Environmental Quality — solar heat gasification
(PB-296624/0) N80-10396
Steam turbines — thermoelectric power generation
(ANL/CES/TE-78-7) N80-10502
Quality assurance in alternative energy sources
(RHO-SA-107) N80-10504
The first small power system experiment, Phase 1: Engineering experiment no. 1 — solar thermal electric power plants
(NASA-CR-162417) N80-10596
Passive solar energy programs and plans
(GPO-36-211) N80-10599
Ocmulgee national monument visitor center solar heating and cooling system design review data
(NASA-CR-150706) N80-10601
Solar heating and cooling systems design and development
(NASA-CR-150618) N80-10602
Economic structure, aggregate production functions and the demand for energy as an intermediate product: A preliminary analysis
(DOE/EIA-0103/8) N80-10607
Dispersed power systems and total energy
(SAND-78-2006C) N80-10608
Safety and environmental implications DOE/Sandia Midtemperature Solar Systems Test Facility
(SAND-78-2292C) N80-10609
EPRI new energy resources department strategy paper
(EPRI-ER-979) N80-10610
Another look at energy conservation
(LBL-7893) N80-10611
Summary report of the Solar Reflective Materials Technology Workshop
(PNL-2763) N80-10613
National energy plan 2
(DOE/TIC-10109) N80-10618
Energy transition in California
(UCRL-15003) N80-10619
Energy conservation and the environment: conflict or complement
(LBL-7882) N80-10621
Solar assisted heat pump overview and summary of in-house research
(BNL-24911) N80-10624
Methodology for identifying materials constraints to implementation of solar energy technologies
(PNL-2711) N80-10625
Survey of solar thermal energy storage subsystems for thermal/electric applications
(ORNL/TM-5758) N80-10627
Comprehensive environment, health, and safety program report, FY 1978
(DOE/EV-0035) N80-10630
Soviet energy balances
(RAND/R-2257-DOE) N80-10634
Department of Energy workshops on industrial energy conservation reporting
(DOE/CS-1830-T3) N80-10635
Resolving environmental issues in energy development: Roles for the Department of Energy and its field offices
(RAND/R-2335-DOE) N80-10636
Summary of major energy legislation of the 95th Congress
(DOE/TIC-10118) N80-10644
Determination of the technical and economic feasibility of luminescent solar concentrators
(SAND-79-7005) N80-10650
Analysis of a LiCl open-cycle absorption air conditioner which utilizes a packed bed for regeneration of the absorbent solution driven by solar heated air
(COO-4546-1) N80-10652
Preliminary analysis of a total solar heating system
(COO-4546-4) N80-10653
Solar generation of industrial steam. Innovative research program subtask
(COO-4546-9) N80-10656
Satellite Power System (SPS) preliminary societal assessment
(HCP/R4024-01/14) N80-10657
Cost-effective control systems for solar heating and cooling applications
(SAN-1592-1) N80-10658
Solar energy system performance evaluation: A-Frame Industries, single family dwelling, Kaneohe, Hawaii
(SOLAR/1010-78/14) N80-10659
Natural gas reserves estimates: A good federal program emerging, but problems and duplications persist
(PB-296628/2) N80-10679
Managerial plan: Executive order 12003 and the National Energy Act
(DOE/TIC-10067) N80-10965
Dimensions/NBS, volume 63, no. 6, June 1979
(PB-297036/9) N80-10975

ENERGY REQUIREMENTS
Energy transition in California
(UCRL-15003) N80-10619
Soviet energy balances
(RAND/R-2257-DOE) N80-10634
Power supply requirements for a tokamak fusion reactor
(ANL/FPP/TM-119) N80-10918

ENERGY SOURCES
Near term potential of wood as a fuel
(HCP/C4101) N80-10389
EPRI new energy resources department strategy paper
(EPRI-ER-979) N80-10610
Health and environmental effects of coal gasification and liquefaction technologies: A workshop summary and panel reports
(PB-297618/1) N80-10701

ENERGY STORAGE
Applications analysis of fixed site hydrogen storage
(SAND-78-8272) N80-10384
Hydrogen storage as a hydride. Citations from the international aerospace abstracts data base
(NTIS/PS-79/0772/8) N80-10402
Conceptual design of thermal energy storage systems for near-term electric utility applications. Volume 2: Appendixes, screening of concepts
(NASA-CR-159411) N80-10622
Methods of estimating the reliability of wind energy systems with storage
(UCRL-15005) N80-10623
Battery Energy Storage Test (BEST) facility
(EPRI-EM-1005) N80-10628
Flywheel energy storage and conversion system for solar photovoltaic applications
(COO-4094-31) N80-10639
Physical properties data compilations relevant to energy storage, 2. Molten salts: Data on single and multi-component salt systems
(NSRDS-NBS-61-PT-2) N80-10643
Experimental and numerical studies of liquid storage tank thermal stratification for a solar energy system
(COO-4479-2) N80-10655
Solar generation of industrial steam. Innovative research program subtask
(COO-4546-9) N80-10656
Solar pond concepts: Old and new
(SERI/TP-35-208) N80-10663
Effect of mechanical energy storage systems on the characteristics of electric vehicles
(UCRL-82710) N80-10664
Lithium batteries. Volume 2: Citations from the NTIS data base
(NTIS/PS-79/0674/6) N80-10671
Lead batteries, volume 2. Citations from the engineering index data base
(NTIS/PS-77/0634) N80-10681
Physical properties data compilations relevant to energy storage. 3: Engineering properties of single and polycrystalline sodium beta and beta-alumina
(PB-297847/6) N80-10946
Energy storage systems for automobile propulsion, 1978 study. 1: Overview and findings
(UCRL-52553-VOL-1) N80-10970

ENERGY TECHNOLOGY
Coal conversion systems: Technical data book
(HCP/T2286-01) N80-10392
Ocmulgee national monument visitor center solar heating and cooling system design review data
(NASA-CR-150706) N80-10601
Solar heating and cooling systems design and development
(NASA-CR-150618) N80-10602
Technology development for phosphoric acid fuel cell powerplant, phase 2
(NASA-CR-159705) N80-10603
Dispersed power systems and total energy
(SAND-78-2006C) N80-10608
EPRI new energy resources department strategy paper
(EPRI-ER-979) N80-10610
Summary report of the Solar Reflective Materials Technology Workshop
(PNL-2763) N80-10613
Energy information data base. Corporate author entries
(DOE/TIC-4585-R1-SUPPL-1) N80-10617
Conceptual design of thermal energy storage systems for near-term electric utility applications. Volume 2: Appendixes, screening of concepts
(NASA-CR-159411) N80-10622
Methods of estimating the reliability of wind energy systems with storage
(UCRL-15005) N80-10623
Solar assisted heat pump overview and summary of in-house research
(BNL-24911) N80-10624
Methodology for identifying materials constraints to implementation of solar energy technologies
(PNL-2711) N80-10625
Sensitivity study of Brayton cycle power plant performance
(SAND-78-8020) N80-10626
Survey of solar thermal energy storage subsystems for thermal/electric applications
(ORNL/TM-5758) N80-10627
Environmental data for energy technology policy analysis. Volume 1: Summary
(MCP/EV/6119-1) N80-10629
Environmental readiness of emerging energy technologies
(DOE/ERD-0022) N80-10631
Resolving environmental issues in energy development: Roles for the Department of Energy and its field offices
(RAND/R-2335-DOE) N80-10636
Selected results from the technology assessment of solar energy program
(LA-UR-79-930) N80-10637
Optimal control studies of a solar heating system
(LA-UR-78-2556) N80-10646
Determination of the technical and economic feasibility of luminescent solar concentrators
(SAND-79-7005) N80-10650
Solar energy system performance evaluation: A-Frame Industries, single family dwelling, Kaneohe, Hawaii
(SOLAR/1010-78/14) N80-10659
Waste Heat Utilization: Proceedings of 1978 Engineering Foundation Conference
(CONF-7808102) N80-10665
Geothermal resources and technology in the United States
(PB-296623/2) N80-10677
Proposed research planning format for the Environmental Assessment Department — needs and concerns of groups concerned with environment and energy issues
(EPRI-EA-1018) N80-10692
Environmental implications for geothermal energy development
(CONF-790445-3) N80-10694

ENERGY TRANSFER
Nonsteady-flow thrust augmenting ejectors
N80-10117
Energy transfer in anisotropic systems. A: Excitation migration in substitutionally disordered one-dimensional solids. B: The spectroscopy of molecules absorbed on metal surfaces
(LBL-8332) N80-10648
Transients in vibrational relaxation of polyatomic molecules at high temperatures by the variable ensounter method
(AD-A070774) N80-10867

ENGINE CONTROL
Control technology
N80-10215

ENGINE DESIGN
Basic problem of aircraft gas turbine engine analytic design, part I
N80-10042
Aeropropulsion 1979 — conferences
(NASA-CP-2092) N80-10205
VSCE technology definition study
(NASA-CR-159730) N80-10222
Composites in future motor hardware: A research view
N80-10309

ENGINE INLETS
An efficient user-oriented method for calculating compressible flow in an about three-dimensional inlets — panel method
(NASA-CR-159578) N80-10134

ENGINE NOISE
Noise reduction
N80-10208

ENGINE PARTS
Materials and structures technology
N80-10210

ENGINE TESTING LABORATORIES
The use of standardized test motors and laboratory tools in the development of missile propulsion technology
N80-10315

ENGINE TESTS
Parametric method of aircraft engine status diagnostics based on limited information
N80-10003
On the influence of short shroud platforms on turbine stage operation — performance tests for shrouded rotor blades on gas turbine engines
N80-10083
Aero-acoustic tests of duct-burning turbofan exhaust nozzles
(NASA-CR-162254) N80-10204
A generalized solid motor development test approach with application to IUS
N80-10314
The use of standardized test motors and laboratory tools in the development of missile propulsion technology
N80-10315

Measurement of thrust transients in rocket motors
N80-10316

ENGINEERING DRAWINGS
Improved RELAP4 jet pump model
[CAAP-TR-046] N80-10590

ENRICHMENT
The jet membrane process for uranium separation and enrichment
[BNL-596] N80-10329

ENTRAINMENT
Large-scale turbulent structures in jets and in flows over cavities and their relationship to entrainment and mixing
N80-10123

Entrainment characteristics of unsteady subsonic jets — for V/STOL aircraft
N80-10124

ENVIRONMENT EFFECTS
Impact of Great Lakes water level fluctuations on coastal wetlands
[PB-296403/9] N80-10590

Environmental data for energy technology policy analysis. Volume 1: Summary
[BCP(EV6419-1] N80-10629

Resolving environmental issues in energy development: Roles for the Department of Energy and its field offices
[RAND/R-2333-DOE] N80-10636

The impact of LNG spills on the environment: A comparison of dispersion models and experimental data
[UCRL-81812] N80-10688

Likelihood estimation of vegetative alteration near known or proposed sources of air pollution
[COO-4497-1] N80-10690

Proposed research planning format for the Environmental Assessment Department — needs and concerns of groups concerned with environment and energy issues
[EPRI-EA-1018] N80-10692

Socioeconomic data requirements for environmental assessment: Coal gasification and liquefaction projects
[CONF-780843-5] N80-10693

Environmental implications for geothermal energy development
[CONF-790443-3] N80-10694

Health and environmental effects of coal gasification and liquefaction technologies: A workshop summary and panel reports
[PB-297658/8] N80-10701

Offshore pipeline corridors and landfalls in coastal Virginia, volumes 1 and 2 and appendices
[PB-297439/2] N80-10708

Types of aquatic microcosms and their research application
[CONF-781101-1] N80-10747

ENVIRONMENT MANAGEMENT
Mineral resources and land-use planning, the Watkins, Colorado case: A workshop synopsis
[ANL/LRP(TM-7] N80-10785

ENVIRONMENT MODELS
The 1977 emissions inventory for southeastern Virginia — environment model of air quality based on exhaust emission from urban areas
[NASA-TM-80119] N80-10685

ENVIRONMENT PROTECTION
Comprehensive environment, health, and safety program report, FY 1978
[DOE/EV-0035] N80-10630

Summary of major energy legislation of the 95th Congress
[DOE/TIC-10118] N80-10644

ENVIRONMENTAL MONITORING
Meteorological data bases available for the United States Department of Energy Oak Ridge Reservation
[ORNL/TM-6758] N80-10739

Types of aquatic microcosms and their research applications
[CONF-781101-1] N80-10747

ENVIRONMENTAL QUALITY
Energy conservation and the environment: conflict or complement
[LBL-7982] N80-10621

ENVIRONMENTAL SURVEYS
The impact of LNG spills on the environment: A comparison of dispersion models and experimental data
[UCRL-81812] N80-10688

ENVIRONMENTAL TESTS
General-purpose heat source project, space nuclear safety program, and radioisotopic terrestrial safety program
[LA-7300-PR] N80-10886

ENZYME ACTIVITY
Effect of hypoxia on ATPase activity of the brain
N80-10776

EPHEMERIS TIME
A time transfer unit for GPS
N80-10167

EQUATIONS OF MOTION
Effects of truncation in modal representations of thermal convection
[NASA-CR-162251] N80-10457

Coupled rotor and fuselage equations of motion
[NASA-TM-81153] N80-10516

Microscopic classical equations of motion calculations of high-energy heavy-ion collisions
N80-10880

EQUILIBRIUM
Equilibrium temperatures in self-contained bearing assemblies. Part 2: First approximation to temperature rise
[ESDU-78027] N80-10495

EQUIPMENT SPECIFICATIONS
Design criteria for dry lubricated flight control bearings — wear tests to make design analysis and check equipment specifications
[AD-A071322] N80-10228

Steam turbines — thermoelectric power generation
[ANL/CES/TE-79-7] N80-10502

Fiber optics transmitter integrated circuit development
[AD-A071437] N80-10909

EROSION
Propellant driven turbulent interior ballistics and wall erosion
[UCRL-81209] N80-10279

Boundary layer models of erosive burning
N80-10291

ERROR ANALYSIS
Navigation and meteorological error equations for some aerodynamic parameters
[NASA-TM-80804] N80-10130

An experimental investigation of the effects of antenna pointing errors on range delays — error analysis of range errors in directional antennas due to time lag
N80-10259

Generating covariance sequences and the calculation of quantization and rounding error variances in digital filters
[AD-A072877] N80-10838

ERROR CORRECTING CODES
A Reed-Solomon decoding program for correcting both errors and erasures
N80-10254

ERROR DETECTION CODES
Error control systems for multi-access communication channels — quality control error detection codes for multichannel communication
N80-10409

Heuristics for determining equivalence of program mutations
[AD-A071795] N80-10816

ERROR FUNCTIONS
Navigation and meteorological error equations for some aerodynamic parameters
[NASA-TM-80804] N80-10130

ESTIMATES
On minimizing integral quadratic estimates
N80-10851

Estimates of attainable leading-edge thrust for wings at subsonic and supersonic speeds
[NASA-TP-1500] N80-10385

ESTIMATING
Comparison of stability and control parameters for a light, single-engine, high-winged aircraft using different flight test and parameter estimation techniques
[NASA-TM-80165] N80-10225

Maximum likelihood identification of linear discrete stochastic systems — estimating and parameter identification in stochastic processes
[AD-A072147] N80-10229

ETHYL ALCOHOL
The biological conversion of corn residue into ethyl alcohol using an immobilized-cell reactor
N80-10376

Biomass-based alcohol fuels: The near-term potential for use with gasoline
[HCP/T4101-03] N80-10395

EVALUATION
Manned engineering flight simulation validation, Part 1. Simulation requirements and simulator motion system performance
[AD-A071394] N80-10235

Improved RELAP4 jet pump model
[CAAP-TR-046] N80-10590

EVAPORATION
Evaluation of a locally homogeneous flow model of spray evaporation
N80-10453

EXCIMER LASERS
Research investigation directed toward extending the useful range of the electromagnetic spectrum
[AD-A071664] N80-10421

EXCITONS
Energy transfer in anisotropic systems. A: Excitation migration in substitutionally disordered one-dimensional solids. B: The spectroscopy of molecules absorbed on metal surfaces
[LBL-8332] N80-10648

EXHAUST EMISSION
Emission reduction
N80-10207

The 1977 emissions inventory for southeastern Virginia — environment model of air quality based on exhaust emission from urban areas
[NASA-TM-80119] N80-10685

Emission assessment of conventional stationary combustion systems. Volume 2: Internal combustion sources
[PB-296390/8] N80-10696

Modeling the impacts of transportation systems management on vehicle emissions, phase 1
[PB-296908/7] N80-10697

EXHAUST GASES
Experimental evaluation of a low emissions high performance duct burner for Variable Cycle Engines (VCE) — supersonic cruise aircraft research
[NASA-CR-159894] N80-10221

Filters for collection of chemical aerosol and fume samples from the air
N80-10731

EXHAUST NOZZLES
Liquid ejector with perforated nozzle
N80-10072

Coannular supersonic ejector nozzles
N80-10128

Aero-acoustic tests of duct-burning turbofan exhaust nozzles
[NASA-CR-162254] N80-10294

Flight effects on the aero/acoustic characteristics of inverted profile coannular nozzles
[NASA-CR-162419] N80-10230

EXOBIOLOGY
Aerospace medicine and biology: A continuing bibliography with indexes — October 1979
[NASA-SP-7011(190)] N80-10778

EXPLORER 12 SATELLITE
Study to analyze and synthesize satellite data
[AD-A070947] N80-10712

EXPLOSIVES
Storage stability of Kraton-bonded HMX-based explosives
[LA-UR-78-2728] N80-10381

EXTRUDING
Continuous coal processing method and means
[NASA-CASE-NPO-13758-2] N80-10377

F

FABRICATION
Centripetal turbine fabrication technology
N80-10078

FABRICS
Electrical charging of fabric and film materials
N80-10048

FACTORIAL DESIGN
Application of the factor interpolation method in flight vehicle landing gear analytic design
N80-10058

Parachute-rocket deceleration system design
N80-10059

FAR INFRARED RADIATION
Magneto-optical studies of paramagnetic systems to determine their potential for use as continuously tunable coherent far-infrared sources
N80-10899

FARM CROPS
Growing energy: Land for biomass farms
[PB-296670/5] N80-10400

FARMLANDS
Growing energy: Land for biomass farms
[PB-296670/5] N80-10400

FATIGUE (MATERIALS)
Fatigue and corrosion fatigue of HY-80 steel, as applicable to anchor bolt failures
[AD-A072067] N80-10330

Constant and variable loading fatigue strength of black-heart malleable cast iron regarding metallurgical characteristics
[ICAF-1009] N80-10511

Fracture mechanics and surface chemistry studies of fatigue crack growth in an aluminum alloy
[AD-A071438] N80-10519

FATIGUE LIFE
Long-life GTE operation based on technical condition — fatigue and service life monitoring of turbine blades in aircraft engines
N80-10027

FATIGUE TESTS
Materials testing for central receiver solar-thermal power systems
[DOE/TIC-10107] N80-10086

FEASIBILITY ANALYSIS
Sugar crops as a source of fuels. Volume 1: Agricultural research
[TID-29400/1] N80-10395

High-temperature strain instrumentation feasibility study
[AD-A072443] N80-10479

FEED SYSTEMS
Continuous coal processing method and means
[NASA-CASE-NPO-13758-2] N80-10377

FEEDBACK
Feedback systems for image acquisition and processing — imaging techniques and optical properties of feedback for image resolution
N80-10906

FEEDBACK CONTROL
Issues in the digital implementation of control compensators
[NASA-CR-163016] N80-10814

FERMENTATION
Sugar crops as a source of fuels. Volume 1: Agricultural research
[TID-29408/1] N80-10395
FIBER COMPOSITES
The scatter of mechanical values of carbon fiber composites and its causes — statistical values of strength
[NASA-TM-75698] N80-10317
Metal matrix composites, volume 2: A bibliography with abstracts
[NTIS/PS-79/0680/3] N80-10324
Metal matrix composites. Volume 3: A bibliography with abstracts
[NTIS/PS-79/0681/1] N80-10325
FIBER OPTICS
A voltage-controlled optical radio frequency-phase shifter
N80-10245
Fiber optics transmitter integrated circuit development
[AD-A071437] N80-10909
Use of predistortion to reduce intermodulation distortion in optical fiber communication sources
[AD-A072637] N80-10910
Fiber optic utilization at the Nevada Test Site — radiation effects on underground cables for analog data transmission
[LA-7029-MS] N80-10912
FIELD EFFECT TRANSISTORS
Non-rectangular mos field effect devices — topology gatefield effect transistors are studied
N80-10429
An ac large signal model for the GaAs MESFET
[AD-A071663] N80-10936
FIELD EMISSION
Emittance measurements on field emitter diodes
[UCRL-82533] N80-10440
FIELD THEORY (PHYSICS)
Mechanisms of proton stability and decay in unified models
[LA-UR-79-361] N80-10875
FIGHTER AIRCRAFT
Prediction of aerodynamic characteristics of fighter wings at high lift
[AD-A072630] N80-10140
Experiments in sensing transient rotational acceleration cues on a flight simulator
[NASA-TP-1537] N80-10193
Manoeuvre limitations of combat aircraft
[AGARD-AR-155A] N80-10203
High-performance-vehicle technology — fighter aircraft propulsion
N80-10219
FILM COOLING
Experimental study of the gasdynamic characteristics of a stator cascade with cooling air discharge through the vane surface
N80-10009
Experimental study of curvilinear surface film cooling effectiveness — film cooling of curvature flat surface turbine blades
N80-10026
FILTRATION
Treatment of refinery wastewater using a filtration-activated carbon system
[PB-295700/1] N80-10972
FINITE DIFFERENCE THEORY
A linearized finite difference computation of fluid heating in an enclosure
[PB-290053/0] N80-10474
Method of lines approach to the numerical solution of conservation laws — time dependent solutions of hyperbolic partial differential equations
[LA-UR-79-837] N80-10841
FINITE ELEMENT METHOD
Analysis of thin-wall beams by the method of segments
N80-10043
Prediction of aerodynamic forces on a circular cylinder and thin airfoil in a transonic airstream by the finite element method
N80-10093
Cross flow fan experiment development and finite element modeling
N80-10098
Acceleration of transonic potentials flow calculations on arbitrary meshes by the multiple grid method
[AD-A072301] N80-10142
Finite-element analysis of laminated composite-material plates
[AD-A071390] N80-10321
An incremental form of the single-integral nonlinear viscoelastic theory for elastic-plastic-creep finite element analysis
[AD-A072151] N80-10523
The application of thermal and creep effects to the combined isotropic-kinematic hardening model for inelastic structural analysis by the finite element method
[AD-A072153] N80-10525
Stress analysis of cylindrical pressure vessels with closely spaced nozzles by the finite-element method. Volume 3: Vessels with three nozzles under internal pressure and external loadings
[NUREG-CR-0507-VOL-3] N80-10527
Viscoplastic finite element analysis of steady-state forming processes including strain history and stress flux dependence
[SAND-77-1663C] N80-10528
On the numerical solution of Helmholtz equation by the finite element method
[DOE/ER-00443-79] N80-10840
FIRES
A linearized finite difference computation of fluid heating in an enclosure
[PB-290053/0] N80-10474
FLAKING
Alpha transport and blistering in tokamaks
[SAND-78-8684] N80-10916
FLAME PROPAGATION
On the flame stabilization mechanism in two-phase fuel-air mixture flow
N80-10013
Analytical modeling of flash-back phenomena — premixed/prevaporized combustion system
[NASA-CR-162389] N80-10330
Modeling of flame properties of methanol
[UCRL-82434] N80-10385
FLAME STABILITY
On the flame stabilization mechanism in two-phase fuel-air mixture flow
N80-10013
Analysis of flame stabilization conditions using the homogeneous reactor model
N80-10017
FLAMEOUT
Ignition and extinction of solid propellants
N80-10284
Ignition and extinction of solid rocket propellants
N80-10285
FLAMES
Combustion of aluminum in solid propellant flames
N80-10295
FLAMMABILITY
Compound oxidized styrylphosphine — flame resistant vinyl polymers
[NASA-CASE-MSC-14903-2] N80-10358
Flammability and thermal stability of polyphosphazenes copolymers, part 1
[AD-A072114] N80-10366
FLAPS (CONTROL SURFACES)
Selecting the geometric parameters and position of a wave flap on the root profile of a swept wing using tunnel test data, part 2
N80-10044
FLASHBACK
Analytical modeling of flash-back phenomena — premixed/prevaporized combustion system
[NASA-CR-162389] N80-10330
FLASHING (VAPORIZING)
One-dimensional model of vapor generation in steady flashing flow
[BNL-NUREG-25616] N80-10468
FLAT PLATES
Some measurements in synthetic turbulent boundary layers — over flat plates in turbulent and laminar flow
N80-10095
Forced response of a Blasius flat-plate boundary layer to an external vortex street
[AD-A072406] N80-10462
FLAT SURFACES
Experimental study of curvilinear surface film cooling effectiveness — film cooling of curvature flat surface turbine blades
N80-10026
FLEXIBILITY
Nonlinear inelastic stability of flexibly-connected plane steel frames
N80-10508
FLIGHT CHARACTERISTICS
Manoeuvre limitations of combat aircraft
[AGARD-AR-155A] N80-10203
Dynamic characteristics of flight simulator motion systems
[AGARD-AR-144] N80-10238
FLIGHT CONTROL
Soviet Aeronautics, volume 21, no. 4
N80-10031
Analytic design of regulators for controlling elastic flight vehicle rotation about the longitudinal axis
N80-10035
Optimal control of flight vehicle with elastic elements
N80-10037
On modeling sensitivity of a linear system to reduction of its order by the infinitesimal transformation method in the yaw motion control problem
N80-10046
Electromechanical flight control actuator
[NASA-CR-160348] N80-10224
Multivariable digital control systems
[AD-A071662] N80-10226
Method of conjugate gradients for optimal control problems with state variable constraints
[AD-A072258] N80-10227
Algorithm for constructing the programmed motion of a bounding vehicle for the flight phase
[NASA-TM-75668] N80-10497
FLIGHT FATIGUE
Psychoprophylaxis of fatigue and functional cardiovascular diseases in pilots by means of self-conditioning
N80-10771
FLIGHT SIMULATION
Pilot performance during simulated approaches and landings made with various computer-generated visual glidepath indicators
[AD-A066220] N80-10151
Experiments in sensing transient rotational acceleration cues on a flight simulator
[NASA-TP-1537] N80-10193
Flight effects on the aeroacoustic characteristics of inverted annular coannular nozzles
[NASA-CR-162419] N80-10220
Visual search performance in simulated remotely piloted vehicle utilization as a function of auxiliary task loading on the observer
[AD-A072402] N80-10804
FLIGHT SIMULATORS
Advanced simulator for pilot training [ASPT]: Great optimization
[AD-A068475] N80-10233
Manned engineering flight simulation validation, Part 1. Simulation requirements and simulator motion system performance
[AD-A071394] N80-10235
Training effectiveness of the CH-47 flight simulators
[AD-A072317] N80-10236
Simulator for air-to-air combat motion system investigation
[AD-A072612] N80-10237
Dynamic characteristics of flight simulator motion systems
[AGARD-AR-144] N80-10238
FLIGHT STABILITY TESTS
Comparison of stability and control parameters for a light, single-engine, high-winged aircraft using different flight test and parameter estimation techniques
[NASA-TM-80163] N80-10225
FLIGHT STRESS (BIOLOGY)
USSR Report: Space Biology and Aerospace Medicine, volume 13, no. 5, 1979 — effects of space flight stress
[JPRS-74470] N80-10752
Effect of space flight conditions on deoxyribonucleoprotein and nucleic acid content of rat tissues
N80-10760
FLIGHT TESTS
Study of the feasibility aspects of flight testing an aeroelastically tailored forward swept research wing on a BQM-34F drone vehicle
[NASA-CR-159149] N80-10195
FLIGHT TRAINING
Training effectiveness of the CH-47 flight simulators
[AD-A072317] N80-10236
FLORIDA
Aircraft measurements of micrometeorological parameters at Panama City, Florida, in 1978
[AD-A070936] N80-10737
Hydrographic observations in the Georgia Bight, July 1977
[PB-297135/6] N80-10742
FLOW CHARACTERISTICS
Soviet aeronautics, volume 21, no. 3 — gas dynamics, flow characteristics, axial flow turbines, and gas turbine engines
N80-10001
FLOW DISTRIBUTION
Application of the gas flow dimensionless characteristics method for experimental study of sonic nozzles
N80-10002
Parametric method of aircraft engine status diagnostics based on limited information
N80-10003
Motion of rectangular wing between parallel walls
N80-10030
Flow around small-aspect-ratio delta wing with vortex "bursting"
N80-10060
Semi-empirical method for determining local heat transfer coefficients for flow around a sphere — effects of conductive heat transfer on subsonic flow distribution
N80-10084
Calculation of optimal coordinates for two-dimensional incompressible flow
N80-10094
Cross flow fan experiment development and finite element modeling
N80-10098
The Martin-Lomax iteration for the computations of transonic flow fields: Some observations
[AD-A072523] N80-10141
Investigation of the boundary condition at a wind tunnel test section wall for a lifting wing-body model at low supersonic speed
[AD-A072098] N80-10143

FLOW EQUATIONS
Numerical prediction of 3-D ejector flows
N80-30111
Viscid/inviscid interaction analysis of thrust augmenting ejectors
N80-30112
Introduction to hydrodynamics
[UCID-18016] N80-30471
FLOW GEOMETRY
Determination of turning angle of a jet impinging on a bucket with vines
N80-30011
FLOW STABILITY
Evaluation of a locally homogeneous flow model of spray evaporation
N80-30453
FLOW VELOCITY
Laser Doppler Velocimeter [LDV] study of secondary flows in turbine cascade
N80-30090
Pressure and velocity measurements in a three-dimensional wall jet
N80-30126
Gas phase velocity measurements in solid rocket propellants by Laser Doppler anemometry
N80-30311
Measurement of phase velocities in mist flows using stagnation probes
[DUREG-CR-0645] N80-30469
FLOW VISUALIZATION
Cryogenic wind tunnel activities at the University of Southampton — flow visualization technique for low speed wind tunnel tests
[NASA-CR-159144] N80-30231
FLUID DYNAMICS
Technical evaluation report on the fluid dynamics panel Symposium on High Angle of attack aerodynamics — slender wings, bodies of revolution, and body-wing configurations
[AGARD-AR-145] N80-30147
Studies on the mixing in a density-stratified shear flow
N80-30454
Fluid dynamic aspects of wind energy conversion
[AGARD-AG-243] N80-30483
FLUID FILMS
Transient aspect of hydroplaning: Hydroplaning phenomenon during sudden changes in the fluid layer on a pavement — effect of fluid films on tires on a highway
N80-30402
FLUIDIZED BED PROCESSORS
Electropolymerization in stationary cells and in packed and fluidized bed electrode cells
N80-30360
Continuous coal processing method and means
[NASA-CASE-NPO-13750-2] N80-30377
Fluid-bed combustion of high sulfur coals
[METC/RI-7904] N80-30386
FLUORO COMPOUNDS
Fluorosilicone silicon compounds and high energy elastomeric polymers
[AD-A072559] N80-30367
Preliminary machining study on fluoroberyllate laser glass
[UCID-18201] N80-30493
FLUTTER
Leading edge flutter of a supercavitating hydrofoil
N80-30483
FLUTTER ANALYSIS
Leading edge flutter of a supercavitating hydrofoil
N80-30483
FLUX [RATE]
X-ray spectroscopy as a diagnostic tool in solid propellant combustion flows
[AD-A070796] N80-30380
FLUX DENSITY
Fundamentals of heat measurement — heat flux transducers
[NASA-TM-75490] N80-30459
FLUX PUMPS
The 50kA flux pump for the superconducting transmission line test bed
[LA-6953-MS] N80-30443
FLYBY MISSIONS
Pioneer Saturn encounter — Pioneer 11 space probe
[NASA-TM-80007] N80-30239
FLYWHEELS
Flywheel energy storage and conversion system for solar photovoltaic applications
[COO-4094-31] N80-30439
FOG
Analysis of statistical parameters from satellite digital data, July 1978 GOES-west, for use in diagnosing marine fog
[AD-A072145] N80-30735
FOLDS [GEOLOGY]
Phototectonic analysis of southeastern Spain from ASTP photographs and LANDSAT images — identification of folds, faults, and lineaments
N80-30548
Photogeologic analysis of ASTP photographs of the Lake Torrens-Flinders Ranges-Lake Blanche area, South Australia — identification of folds, faults, and lineaments
N80-30550
FOOD
Models for the migration of paraffinic additives in polyethylene
[PB-297671/0] N80-30372
FOREBODIES
Integration of ejectors into high-speed aircraft — forebody effects
N80-30119
FORECASTING
Energy supply and demand in the midterm: 1985, 1990, and 1995
[DOE/EIA-0102/52] N80-30620
FORESTS
Design of a pilot silvicultural biomass farm at the Savannah River Plant
[HCP/T4101-01] N80-30394
FORMAT
Computer mapping software and geographic data base development: Oak Ridge National Laboratory user experience
[CONF-790727-1] N80-30386
FORMING TECHNIQUES
Determination of constitutive equations for high strength Aluminum and Titanium alloys applicable to sheet metal formability
[AD-A072121] N80-30346
FORTRAN
An improved FORTRAN reorganizer
[AD-A071334] N80-30822
FOSSIL FUELS
Compiling a multistate emissions inventory — fossil fuel electric power production
[BNL-25943] N80-30691
FOUNDATIONS
The 10MW[e] solar thermal central receiver pilot plant: Heliostat foundation and interface structure investigations
[SAND-78-8180] N80-30612
FOURIER TRANSFORMATION
An improvement in Fourier transform accuracy — statistical analysis of fourier transformation algorithms when seeking a single frequency
N80-30261
FRACTURE MECHANICS
Fracture characteristics of structural steels, reference manual
[AD-A072054] N80-30349
Fracture mechanics of inelastic polymers
[AD-A072615] N80-30368
Computer model for ductile fracture — nuclear reactor pressure vessels
[UCID-18070] N80-30526
Mathematical analysis of stress cracks, volume 3. A bibliography with abstracts
[NTIS/PS-79/0804/9] N80-30531
FRACTURE STRENGTH
Quasi-static crack growth in metals at elevated temperature, a review
[AD-A072347] N80-30348
Dependence of fracture toughness of molybdenum laser welds on dendritic spacing and in situ titanium additions
[SAND-79-0193C] N80-30581
FRAMES
Nonlinear inelastic stability of flexibly-connected plane steel frames
N80-30308
FREDHOLM EQUATIONS
Construction of well-conditioned systems for Fredholm I problems by mesh adapting
[COO-2482-10] N80-30845
FREE CONVECTION
Effects of truncation in modal representations of thermal convection
[NASA-CR-162251] N80-30457
FREQUENCIES
An improvement in Fourier transform accuracy — statistical analysis of fourier transformation algorithms when seeking a single frequency
N80-30261
FREQUENCY ASSIGNMENT
JTIDS: The issue of frequency selection — low frequency assignment for pulse communication navigation aids
N80-30183
JTIDS signal structure
N80-30184
FREQUENCY CONTROL
Frequency-domain approaches to linear multivariable control systems design — control theory and mathematical models for linear frequency control systems
N80-30432
FREQUENCY CONVERTERS
Frequency down-converters as applied to VLBI
N80-30251
FREQUENCY STABILITY
A voltage-controlled optical radio frequency-phase shifter
N80-30245
FREQUENCY STANDARDS
Clocks: Evolution of frequency standards
N80-30161
Projected state-of-the-art for frequency standards for the DSN in the 1982 - 1990 time frame
N80-30248
Radio frequency performance of DSS 14 64-m antenna at X-band using a dual hybrid mode feed
N80-30258
FRICTION
The turbulent boundary layer on a curvilinear surface
N80-30020
FUEL CELLS
Technology development for phosphoric acid fuel cell powerplant, phase 2
[NASA-CR-159705] N80-30603
FUEL COMBUSTION
On the question of selecting the characteristic quantity governing fuel self-ignition in a stream
N80-30008
Analytical modeling of flash-back phenomena — premixed/prevaporized combustion system
[NASA-CR-162309] N80-30330
Modeling of flame properties of methanol
[UCRL-82434] N80-30385
Development of combustion data to utilize low Btu gases as industrial process fuels. Project 61004 special report no. 4: High-forward-momentum burner
[FE-2489-33] N80-30390
Development of gas turbine fuels and combustion; An overview
[CONF-790337-4] N80-30391
FUEL CONSUMPTION
Aircraft Energy Efficiency [ACEE] status report
N80-30296
FUEL INJECTION
On the question of selecting the characteristic quantity governing fuel self-ignition in a stream
N80-30008
Characteristics of afterburning bypass turbojet engine with oxygen injection into the afterburner chamber — study of fuel injection into thrust chambers for thrust augmentation
N80-30029
FUEL PUMPS
On the influence of liquid oscillations in fuel line on the head of a pump operating in regimes with reverse flow
N80-30010
FUEL-AIR RATIO
Study of homogeneous combustion chamber temperature field nonuniformity with primary zone parameter variation — of fuel-air parameters
N80-30065
FUNCTIONS [MATHEMATICS]
Use of wagner functions in airfoil design optimization
[AD-A072634] N80-30139
FUSELAGES
Coupled rotor and fuselage equations of motion
[NASA-TM-81153] N80-30316
FUSION REACTORS
Tensile properties of type 316 stainless steel irradiated in a simulated fusion reactor environment
[CONF-790125-50] N80-30355
Proposal for the theoretical investigation of light-ion beam propagation through a residual plasma environment — for inertial confinement fusion reactors
[LA-7590-P] N80-30911
FV-12A AIRCRAFT
The XFV-12A Thrust-Augmented Wing (TAW) prototype aircraft
N80-30133

G

GALERKIN METHOD
Effects of truncation in modal representations of thermal convection
[NASA-CR-162251] N80-30457
GALILEO PROJECT
Design of a quick-look decoder for the DSN (7,1/2) convolutional code — Galileo Project
N80-30253
GALLIUM ARSENIDES
Polycrystalline thin film gallium arsenide solar cells
[PB-298168/6] N80-30675
An ac large signal model for the GaAs MESFET
[AD-A071663] N80-30936
Rectification at N-N GaAS: [Ga, Al]As heterojunctions
[AD-A071732] N80-30937
Rectification at nGaAs - n Ga.7Al.3As heterojunctions grown by LPE
[AD-A071733] N80-30938
Electronic characteristics of 3 - 5 compounds — electrophysics study of atomic structures of gallium arsenides and indium phosphides
[AD-A071447] N80-30939

GAMMA RAY ASTRONOMY
Algorithms for locating celestial sources of X-rays and gamma flares with the aid of several spacecraft
[NASA-TM-79920] N80-10991

GAMMA RAY TELESCOPES
Experimental study of the vidicon system for information recording using the wide-gap spark chamber of gamma - telescope gamma-1
[NASA-TM-75644] N80-10478

GAMMA RAYS
Ultrastructural changes in canine hepatocytes during continuous chronic exposure to low doses of gamma radiation
N80-10768

GAS ANALYSIS
Regional air pollution study. Dichotomous aerosol sampling system
[PB-297316/5] N80-10338

GAS CHROMATOGRAPHY
Analysis of organic air pollutants by gas chromatography and mass spectroscopy
[PB-296835/2] N80-10699
Evaluation of atmospheric trace constituent sensors operating from remote space and airborne platforms
[NASA-CR-162565] N80-10711

GAS COMPOSITION
Toxic effects of chemicals in the altered gas environment of pressurized chambers
N80-10775

GAS DENSITY
Investigation of alveoloarterial difference for oxygen and carbon dioxide when breathing high-density gas mixtures
N80-10774

GAS DYNAMICS
Application of the gas flow dimensionless characteristics method for experimental study of sonic nozzles
N80-10002
Experimental study of the turbulent wake downstream of a fan jet
N80-10018
Analog modeling in studying supersonic flow around a wing and its governing analog-criteria
N80-10038
Gas curtains in gas turbine engines
N80-10063
The jet membrane process for uranium separation and enrichment
[RE-586] N80-10329
Transient phenomena in thermal explosion of confined gases
N80-10373

GAS EXPLOSIONS
Transient phenomena in thermal explosion of confined gases
N80-10373

GAS FLOW
Application of the gas flow dimensionless characteristics method for experimental study of sonic nozzles
N80-10002
Study of self-oscillatory liquid film flow regime in coaxial air stream
N80-10004
Heat transfer in turbulent gas flows with high-frequency pressure oscillations
N80-10064
Gas phase velocity measurements in solid rocket propellants by Laser Doppler anemometry
N80-10311
A linearized finite difference computation of fluid heating in an enclosure
[PB-290053/0] N80-10474

GAS GENERATORS
Gas generator propellants for air-to-air missiles
N80-10297

GAS JETS
The jet membrane process for uranium separation and enrichment
[RE-586] N80-10329

GAS LASERS
DARPA-NRL laser program
[AD-A072359] N80-10489

GAS MIXTURES
Influence of gas turbine engine combustion chambers geometric parameters on mixture formation characteristics
N80-10006
Development of combustion data to utilize low Btu gases as industrial process fuels. Project 61004 special report no. 4: High-forward-momentum burner
[FE-2489-33] N80-10390
Thermal conductivity of the helium-argon system — prediction analysis techniques for thermal conductivity of argon helium gas mixtures
[ANL-79-3] N80-10953

GAS TURBINE ENGINES
Soviet aeronautics, volume 21, no. 3 — gas dynamics, flow characteristics, axial flow turbines, and gas turbine engines
N80-10001
Influence of gas turbine engine combustion chambers geometric parameters on mixture formation characteristics
N80-10006
Study of heat-pipe heat exchanger in the small gas turbine engine system
N80-10022
Analytic representation of turbine characteristics in form convenient for computer calculation of GTE parameters
N80-10024
Basic problem of aircraft gas turbine engine analytic design, part 1
N80-10042
Soviet Aeronautics, volume 22, no. 1 — aerodynamics of gas turbine engines
N80-10061
Gas curtains in gas turbine engines
N80-10063
Selection of optimal parameters of heat-pipe heat exchanger for a gas turbine engine
N80-10068
Systematization of simple detail parts of regulable nozzle of gas turbine engine
N80-10071
Generalized heat and mass transfer law for internal flows
N80-10073
Dynamics of diesel fuel combustion in turbulent flow
N80-10074
Study of mass exchange between primary zone and secondary air jets in gas turbine engine combustion chambers
N80-10075
On the influence of short shroud platforms on turbine stage operation — performance tests for shrouded rotor blades on gas turbine engines
N80-10083
Study of size distribution of oil drops formed in GTE oil
N80-10088
Nonstationarity of heat transfer in axial turbine blading during engine startup
N80-10089
Control technology
N80-10215
Analysis of the response of a thermal barrier coating to sodium and vanadium doped combustion gases
[NASA-TM-79205] N80-10344
Development of gas turbine fuels and combustion; An overview
[CONF-790337-4] N80-10391
Emission assessment of conventional stationary combustion systems. Volume 2: Internal combustion sources
[PB-296390/8] N80-10696

GAS TURBINES
Correlation of experimental data on two-phase-flow heat transfer in convergent part of a nozzle
N80-10021
Aerodynamic efficiency of gas turbine intake duct — for gas turbine power plants
N80-10077
Development of silicon nitride of improved toughness
[NASA-CR-159676] N80-10319
Applications survey: evaluation of gas turbine needs
[EPRI-AF-911] N80-10498
Contact stress analysis of ceramic-to-metal interfaces
[AD-A072073] N80-10522
Screening evaluation of novel power cycles integrated with gasification plants
[EPRI-AF-1002] N80-10685
Brayton isotope power system, phase I
[TID-28927] N80-10615

GAS VALVES
Unloading the drive of gas distributor valves operating at high pressures
N80-10081

GAS-METAL INTERACTIONS
Alpha transport and blistering in tokamaks
[SAND-78-8684] N80-10916

GAS-SOLID INTERFACES
Experimental determination and modeling of dry deposition for ozone
N80-10684

GASIFICATION
Biomass energy enhancement: A report to the President's Council on Environmental Quality — solar heat gasification
[PB-296624/0] N80-10396

GASOHOL [FUEL]
Biomass-based alcohol fuels: The near-term potential for use with gasoline
[HCP/T4101-03] N80-10393

GASOLINE
Research guidance studies to assess gasoline from coal by methanol-to-gasoline and sasol-type Fischer-Tropsch technologies
[FE-2447-13] N80-10388
Biomass-based alcohol fuels: The near-term potential for use with gasoline
[HCP/T4101-03] N80-10393

GATES [CIRCUITS]
Non-rectangular mos field effect devices — topology gatefield effect transistors are studied
N80-10429

GENERAL AVIATION AIRCRAFT
Light airplane crash tests at three roll angles
[NASA-TP-1477] N80-10512

GEOCHEMISTRY
Regional geochemical exploration for mineral deposits in the appalachians of central and northwestern Virginia
N80-10534

GEOCHRONOLOGY
Detection of a probable ancestral delta of the Nile River
N80-10571

GEOGRAPHY
Computer mapping software and geographic data base development: Oak Ridge National Laboratory user experience
[CONF-780727-1] N80-10586

GEOLOGICAL FAULTS
Geologic analysis of ASTP photographs of parts of southern California
N80-10540
Marda fault zone and the opening of the Red Sea
N80-10541
Evaluation of satellite images of the Levantine Rift zone
N80-10542
Analysis of Skylab and asip photographs of the Levantine (Dead Sea) fault zone
N80-10543
Analysis and synthesis of space imagery of the southeastern-Turkey/northwestern-Iran mobile belt
N80-10544
Structural pattern of the northern part of the eastern desert of Egypt
N80-10545
Photolineaments in the ASTP stereostrip of the western desert of Egypt
N80-10546
Phototectonic analysis of southeastern Spain from ASTP photographs and LANDSAT images — identification of folds, faults, and lineaments
N80-10548
East-West pervasive lineaments in central and southeastern Spain
N80-10549
Photogeologic analysis of ASTP photographs of the Lake Torrens-Flinders Ranges-Lake Blanche area, South Australia — identification of folds, faults, and lineaments
N80-10550
The 1978 symposium on the Rio Grande Rift. Program and abstracts
[LA-7487-C] N80-10735

GEOLOGICAL SURVEYS
Borehole geological assessment
[NASA-CASE-NPO-14231-1] N80-10709

GEOMAGNETISM
Magnetic potential plots over the northern hemisphere for 26-28 March 1976
[PB-297195/0] N80-10718

GEOMETRY
A thermal vegetation canopy model of sensor response
N80-10535

GEOPHYSICS
Geophysics, astronomy and space, no. 432
[JPRS-74125] N80-10269

GEORGIA
Hydrographic observations in the Georgia Bight, July 1977
[PB-297123/6] N80-10742

GEOTHERMAL ENERGY CONVERSION
Overview of geothermal energy in the United States
[CONF-790530-1] N80-10661
Geothermal resources and technology in the United States
[PB-296623/2] N80-10677
Environmental implications for geothermal energy development
[CONF-790445-3] N80-10694

GEOTHERMAL RESOURCES
Environmental implications for geothermal energy development
[CONF-790445-3] N80-10694

GERMANY
Standards system in Canada, the UK, West Germany, and Denmark: An overview
[PB-296912/9] N80-10487

GLASS
The relationship between excitation intensity and photochromic glass kinetics
[PM-692] N80-10362
Preliminary machining study on fluoroberyllate laser glass
[UCID-18291] N80-10493
Experimental joule-heated ceramic melter for converting radioactive waste to glass
[DP-MS-78-59] N80-10688

GLIDE PATHS
Pilot performance during simulated approaches and landings made with various computer-generated visual glidepath indicators
[AD-A066220] N80-10131
GLOBAL POSITIONING SYSTEM
Principles and operational aspects of precision position determination systems
[AGARD-AG-245] N80-10134
Transit: The current satellite navigation system
N80-10136
The timation navigation satellites
N80-10157
Principle of operation of NAVSTAR and system characteristics
N80-10158
Global positioning system: Signal structure and performance characteristics
N80-10159
The GPS navigation message
N80-10160
Clocks: Evolution of frequency standards
N80-10161
GPS time
N80-10162
Master control station — of the Global Positioning System
N80-10163
GPS master control station operations
N80-10164
Monitor stations
N80-10165
The GPS uplink station
N80-10166
A time transfer unit for GPS
N80-10167
Ephemeris and clock determination in GPS
N80-10168
Texas instruments phase I GPS user equipment
N80-10169
GPS receiver operation
N80-10170
Phase 2 GPS receiver design philosophy
N80-10171
Performance enhancement of the GPS receiver by data-free operation
N80-10172
Integration of GPS with inertial navigation systems
N80-10173
Application of GPS to low cost tactical weapons
N80-10174
Civil applications of NAVSTAR GPS
N80-10175
Launch Vehicles — for the gps satellites
N80-10176
Alternate constellations for the global positioning system
N80-10177
On the optimal selection of satellites in GPS
N80-10178
GLOW DISCHARGES
Study of a tokamak cleaning method utilizing glow discharge
[ORNL-TR-4664] N80-10921
GOAL THEORY
Resolving environmental issues in energy development: Roles for the Department of Energy and its field offices
[RAND/R-2335-DOE] N80-10636
GOLD ALLOYS
Magnetic order in gold-iron alloys
[UCRL-52636] N80-10942
GOVERNMENT PROCUREMENT
Energy saving strategies for federal procurement
[PB-296969/9] N80-10678
Computer systems conversion: A management perspective
[PB-297004/1] N80-10832
GRADIENTS
Design, engineering, and manufacturing aspects of gradient index optical components — lens design using aberration coefficients for gradient lens
N80-10900
GRAINS [FOOD]
Lodging of grain crops and its detection by aerial photography
N80-10994
GRAPHITE
Atom-surface interactions derived from scattering data
N80-10925
GRAPHITE-EPOXY COMPOSITE MATERIALS
Morphology of rubber modified epoxy encapsulants
[SAND-79-0158C] N80-10570
GRAVITATIONAL EFFECTS
Use of short-arm centrifuge to prevent deconditioning when immersed in water [according to H-reflex]
N80-10772
GREAT LAKES [NORTH AMERICA]
Impact of Great Lakes water level fluctuations on coastal wetlands
[PB-296403/9] N80-10590
GRINDING [MATERIAL REMOVAL]
Mathematical models of the process of vibrational grinding of parts with autonomous vibrations in the vibromachine container
N80-10923
GROUND STATIONS
Monitor stations
N80-10165
The GPS uplink station
N80-10166
Ephemeris and clock determination in GPS
N80-10168
Demonstration of remote clock monitoring by VLBI, with three baseline closure
N80-10247
GROUND-AIR-GROUND COMMUNICATIONS
Integration developments
N80-10188
GROUP THEORY
General relativistic gravitation as the theory of broken symmetry of intransitive groups of transformations
[SLAC-PUB-2167] N80-10856
GULF OF MEXICO
Interpreting ASTP photographs of the ocean and locating the area photographed, case study of the Gulf of Mexico
N80-10562
Aircraft measurements of micrometeorological parameters at Panama City, Florida, in 1978
[AD-A079956] N80-10757
GUNS [ORDNANCE]
Propellant driven turbulent interior ballistics and wall erosion
[UCRL-81289] N80-10279

H

HAMILTONIAN FUNCTIONS
Semiclassical quantization of Nonseparable Hamiltonian Systems — measure and integration of hamiltonian function in atomic physics
N80-10865
HANFORD REACTORS
Quality assurance in alternative energy sources
[RHO-SA-107] N80-10504
HARDENING [MATERIALS]
The application of thermal and creep effects to the combined isotropic-kinematic hardening model for inelastic structural analysis by the finite element method
[AD-A072153] N80-10525
HARDWARE
Computer systems conversion: A management perspective
[PB-297004/1] N80-10832
HARMONICS
Computer calculations of traveling-wave periodic structure properties
[SLAC-PUB-2295] N80-10423
HARTREE APPROXIMATION
Time-dependent Hartree-Fock phase: Unique implication of variational principle
[ORO-5126-50] N80-10842
HASTELLOY [TRADEMARK]
Creep behavior of Hastelloy X, 21/4 Cr-1 Mo steel, and other alloys in simulated HTGR helium
[ORNL/TM-6822] N80-10357
HAWAII
LANDSAT project, State of Hawaii: A preliminary report
[PB-296712/3] N80-10587
Solar energy system performance evaluation: A-Frame Industries, single family dwelling, Kaneohe, Hawaii
[SOLAR/1010-78/14] N80-10659
HAZARDS
The potential of carbon fiber induced shock hazards in household toasters
[NASA-CR-159147] N80-10434
Risk analysis methodology and data: Study of alternatives for long-term management of Hanford defense high-level radioactive waste
[NSC-PS-ARH-77001] N80-10891
Immobilization of hazardous residuals by encapsulation — using a polyester matrix
[PB-296642/2] N80-10897
HEAD [FLUID MECHANICS]
On the influence of liquid oscillations in fuel line on the head of a pump operating in regimes with reverse flow
N80-10810
HEALTH
Health prognosis in flight discussed
N80-10995
HEART DISEASES
Psychoprophylaxis of fatigue and functional cardiovascular diseases in pilots by means of self-conditioning
N80-10771
HEART FUNCTION
Roentgenological examination of the human heart after 100-day hypokinesia
N80-10759
HEAT EXCHANGERS
Study of heat-pipe heat exchanger in the small gas turbine engine system
N80-10822
Selection of optimal parameters of heat-pipe heat exchanger for a gas turbine engine
N80-10868
Investigation of microtubular ceramic structures — fabricating heat exchangers using polyurethane foam and ceramic coatings
[AD-A072144] N80-10369
State-of-the-art survey of joinability of materials for OTEC heat exchangers
[ORNL/TM-6284] N80-10647
Portable breathing system — a breathing apparatus using a rebreathing system of heat exchangers for carbon dioxide removal
[NASA-CASE-MSC-16182-1] N80-10799
HEAT FLUX
On the study of heat transfer with the aid of a local heat flux sensor
N80-10807
Fundamentals of heat measurement — heat flux transducers
[NASA-TM-75490] N80-10459
HEAT GENERATION
Development of an air heater for a mixture formation test rig — heating equipment for heat generation in hypersonic wind tunnels
[RAE-TRANS-2012] N80-10232
HEAT MEASUREMENT
On the study of heat transfer with the aid of a local heat flux sensor
N80-10807
Fundamentals of heat measurement — heat flux transducers
[NASA-TM-75490] N80-10459
HEAT OF VAPORIZATION
Heat of vaporization spectrometer
[BNL-24973] N80-10480
HEAT PIPES
Study of heat-pipe heat exchanger in the small gas turbine engine system
N80-10822
Selection of optimal parameters of heat-pipe heat exchanger for a gas turbine engine
N80-10868
Heat pipe thermal control of slender optics probes
[LA-UR-79-3169] N80-10467
Performance limits for liquid-metal heat pipes containing long adiabatic sections
[LA-UR-79-1241] N80-10472
HEAT PUMPS
Solar assisted heat pump overview and summary of in-house research
[BNL-24911] N80-10624
HEAT RESISTANT ALLOYS
Materials and structures technology
N80-10210
HEAT SOURCES
General-purpose heat source project, space nuclear safety program, and radioisotopic terrestrial safety program
[LA-7560-PR] N80-10886
HEAT STORAGE
Survey of solar thermal energy storage subsystems for thermodielectric applications
[ORNL/TM-5758] N80-10627
Numerical simulation of dual-media thermal energy storage systems — fluid and solid temperature distributions
[SAND-78-2282C] N80-10642
Economic performance of passive solar heating: A preliminary analysis
[LA-UR-78-2861] N80-10645
State of the art of sensible heat storage for solar heat pump systems
[BNL-25909] N80-10651
Performance monitoring of an off-peak heating and cooling system utilizing thermal storage and solar augmented heat pump
[EPRI-ER-945] N80-10662
Modeling for moving boundary problems
[CONF-790345] N80-10843
HEAT TRANSFER
Self-similar solutions in the destruction and melting problem with account for abrupt density change — heat transfer problems for composite thermoprotective coatings
N80-10841
Heat transfer in turbulent gas flows with high-frequency pressure oscillations
N80-10864
Some measurements of ignition delay and heat transfer with pyrogen igniters
N80-10290
Re-establishment of laminar flow on a Heated Submerged Vehicle
[AD-A072566] N80-10463
HEAT TRANSFER COEFFICIENTS
The turbulent boundary layer on a curvilinear surface
N80-10820
Correlation of experimental data on two-phase-flow heat transfer in convergent part of a nozzle
N80-10821

Experimental determination of heat transfer coefficient when emptying gas vessels — study of heat transfer coefficient in pneumatic equipment for compressed gas in a pressure vessel
N80-10030

Generalized heat and mass transfer law for internal flows
N80-10073

Application of gradient method to study of heat transfer in axisymmetric channels of different configuration
N80-10080

Semi-empirical method for determining local heat transfer coefficients for flow around a sphere — effects of conductive heat transfer on subsonic flow distribution
N80-10084

Nonstationarity of heat transfer in axial turbine blading during engine startup
N80-10089

Heat transfer into the infinite region external to a cylinder
[SAND-78-1942] N80-10466

HEAT TRANSMISSION
One- and two-dimensional heating analyses of fusion synfuel blankets
[RNL-NUREG-25635] N80-10922

HEATING
Warmup of LRE chambers with regenerative cooling
N80-10087

Performance monitoring of an off-peak heating and cooling system utilizing thermal storage and solar augmented heat pump
[EPRI-ER-845] N80-10462

HEATING EQUIPMENT
Development of an air heater for a mixture formation test rig — heating equipment for heat generation in hypersonic wind tunnels
[RAE-TRANS-2012] N80-10232

Optimal control studies of a solar heating system
[LA-UR-78-2556] N80-10646

Optimal insulation of pipes and tanks for solar heating systems
[ALO-5319-2] N80-10660

Microwave heating: Industrial applications. Citations from the engineering data base
[NTIS/PS-79/0632/4] N80-10674

Evaluation of heat flow components from heater to skin in an electric thermal suit
N80-11000

HEAVY IONS
Microscopic classical equations of motion calculations of high-energy heavy-ion collisions
N80-10880

Telescoping beams for heavy ion fusion
[CONF-790327-100] N80-10917

HELICOPTER DESIGN
Coupled rotor and fuselage equations of motion
[NASA-TM-81153] N80-10516

HELICOPTERS
Mechanical components
N80-10213

HELIOSTATS
The 10MW[e] solar thermal central receiver pilot plant: Heliostat foundation and interface structure investigation
[SAND-78-8180] N80-10612

HELIUM
Production of hydrogen, deuterium, and helium by 15-MeV neutrons
[COO-2719-5] N80-10873

Atom-surface interactions derived from scattering data
N80-10925

Measurements of thermal conductivity of bcc He-3 at very low temperatures
N80-10929

Thermal conductivity of the helium-argon system — prediction analysis techniques for thermal conductivity of argon helium gas mixtures
[ANL-79-3] N80-10953

HELIUM FILM
An attempt to produce both thick and thinned flowing superfluid films. 1: A study of the feasibility of verifying Lifshitz's theory of Van der Waals force for a metallic surface. 2: The electrohydrodynamic instability of the super-thick helium film
N80-10932

HELIUM ISOTOPES
Diffraction dissociation of high energy proton on helium
[CONF-780826-10] N80-10870

Proton-helium elastic scattering from 40 to 400 GeV
[CONF-780826-9] N80-10871

HELMHOLTZ EQUATIONS
On the numerical solution of Helmholtz equation by the finite element method
[DOE/ER-03443-79] N80-10840

HEURISTIC METHODS
Heuristics for determining equivalence of program mutations
[AD-A071795] N80-10816

Set covering algorithms using cutting planes, heuristics, and subgradient optimization: A computational study
[AD-A072458] N80-10820

HIERARCHIES
Strip trees: A hierarchical representation for map features
[AD-A071124] N80-10582

HIGH ACCELERATION
Internal ballistic problems of Helmut highly accelerated solid propellant rockets
N80-10298

HIGH ALTITUDE BREATHING
Pulmonary adaptation to high altitude
[AD-A068317] N80-10704

HIGH ENERGY ELECTRONS
High energy electron radiation of wastewater liquid residuals
[PB-297593/6] N80-10976

HIGH ENERGY INTERACTIONS
Proton deuteron elastic scattering from 20 to 220 GeV/c
N80-10863

Dimuon production in 15.5 GeV/c pion p interactions
N80-10864

Diffraction dissociation of high energy proton on helium
[CONF-780826-10] N80-10870

Proton-helium elastic scattering from 40 to 400 GeV
[CONF-780826-9] N80-10871

Microscopic classical equations of motion calculations of high-energy heavy-ion collisions
N80-10880

Production and detection of new neutrinos
[ORO-3992-346] N80-10882

New particles, theoretical
[LBL-7977] N80-10887

Experimental review of beam polarization in high energy positron electron storage rings
[SLAC-PUB-2258] N80-10896

Asymptotic freedom without guilt — quantum chromodynamics and quark confinement
[UH-511-329-79] N80-10932

HIGH ENERGY PROPELLANTS
Fluorodinitro silicon compounds and high energy elastomeric polymers
[AD-A072599] N80-10367

HIGH FREQUENCIES
Electrochemical copper coatings for surface finishing of hf resonators
[LA-TR-79-10] N80-10352

HIGH GAIN
Shuttle orbiter Ku-band radar/communications system design evaluation: High gain antenna/widebeam horn
[NASA-CR-160316] N80-10275

HIGH POWER LASERS
High peak power pulsed WIP electron gun
[UCRL-13950] N80-10877

HIGH PRESSURE
Unloading the drive of gas distributer valves operating at high pressures
N80-10081

Some hemodynamic parameters during respiration of oxygen under excessive pressure
N80-10765

High temperature science: Future needs and anticipated development in high-density shock-wave research
[UCID-18072] N80-10857

HIGH STRENGTH ALLOYS
Determination of constitutive equations for high strength Aluminum and Titanium alloys applicable to sheet metal formability
[AD-A072121] N80-10346

HIGH TEMPERATURE
The effect of environmental variables on the stress corrosion cracking behavior of type 304 stainless steel in high temperature water environments
N80-10347

High-temperature strain instrumentation feasibility study
[AD-A072443] N80-10479

High temperature tungsten-rhenium thermocouples with molybdenum-rhenium sheaths
[TFBP-TR-285] N80-10482

HIGH TEMPERATURE GASES
Start up system for hydrogen generator used with an internal combustion engine
[NASA-CASE-NPO-13849-1] N80-10374

HIGH TEMPERATURE RESEARCH
Improving the stress rupture and creep of silicon nitride — turbine materials
[NASA-CR-159585] N80-10318

High temperature science: Future needs and anticipated development in high-density shock-wave research
[UCID-18072] N80-10857

HIGH TEMPERATURE TESTS
Quasi-static crack growth in metals at elevated temperature, a review
[AD-A072347] N80-10348

HIGHWAYS
Transient aspect of hydroplaning: Hydroplaning phenomenon during sudden changes in the fluid layer on a pavement — effect of fluid films on tires on a highway
N80-10448

HILSCH TUBES
Study of combined operation of self-evacuating vortex tube with diffuser
N80-10085

HMX
Storage stability of Kraton-bonded HMX-based explosives
[LA-UR-78-2720] N80-10381

HOLOGRAMMETRY
Digital reconstruction of acoustic holograms
N80-10475

HOMOPOLAR GENERATORS
Power supply requirements for a tokamak fusion reactor
[ANL/FPP/TM-119] N80-10918

HORN ANTENNAS
Shuttle orbiter Ku-band radar/communications system design evaluation: High gain antenna/widebeam horn
[NASA-CR-160316] N80-10275

HUMAN BEHAVIOR
Life stress, self-preoccupation, and social supports
[AD-A068634] N80-10789

Research on the psychophysiological basis of human vigilance
[AD-A068562] N80-10790

Summary of project to develop handbook of human reliability analysis for nuclear power plant operations
[SAND-78-1812C] N80-10797

HUMAN BEINGS
Some hemodynamic parameters during respiration of oxygen under excessive pressure
N80-10765

Amount of microorganisms discharged from the upper respiratory tract and integument of people confined in a sealed chamber
N80-10767

HUMAN FACTORS ENGINEERING
Human factors in the design and evaluation of aviation maps
[AGARD-AG-225] N80-10536

Use of the pupil to study the scotopic and chromatic mechanisms of vision in humans
N80-10777

Plasma volume changes in fit men and women during a humid heat stress before and after an acclimation
N80-10781

Thermal conduction effects in human skin. Phase 2: Experimental validation and application of data in selection of materials
[AD-A068480] N80-10783

Research on the psychophysiological basis of human vigilance
[AD-A068562] N80-10790

Remote operator performance comparing mono and stereo TV displays: The effects of visibility, learning and task factors
[AD-A068391] N80-10793

Summary of project to develop handbook of human reliability analysis for nuclear power plant operations
[SAND-78-1812C] N80-10797

Design considerations for the man-machine relations user interface to TAS
[AD-A071207] N80-10802

Revised height/weight sizing programs for men's protective flight garments
[AD-A070732] N80-10803

Effects of retrieval term specificity on information retrieval from computer-based intelligence systems
[AD-A072312] N80-10958

Principles of ergonomic standards discussed
N80-10998

HUMAN PERFORMANCE
Summary of project to develop handbook of human reliability analysis for nuclear power plant operations
[SAND-78-1812C] N80-10797

Human vigilance investigation analysis of the pattern array test [further data analysis]
[UCRL-13891-3] N80-10798

HUMAN REACTIONS
The effect of the duration of jet aircraft flyover sounds on judged annoyance — noise predictions and noise measurements of jet aircrafts and human reactions to the noise intensity
[NASA-CR-159132] N80-10839

HYDRAULIC TEST TUNNELS
A low velocity water tunnel for biological research
N80-10271

HYDROCARBON FUEL PRODUCTION
Molten salt pyrolysis of latex — for hydrocarbon fuel production
[NASA-CASE-NPO-14315-1] N80-10361

HYDROCARBON FUELS
Molten salt pyrolysis of latex — for hydrocarbon fuel production
[NASA-CASE-NPO-14315-1] N80-10361

Fuels by algae hydrogenation
N80-10375

HYDROCARBONS
Fischer-Tropsch synthesis over nickel catalysts — chemical reaction of nickel catalysts over hydrocarbons
N80-10526
Remote sensing of LNG spill vapor dispersion using Raman LIDAR
[UCRL-13984] N80-10489
HYDRODYNAMICS
Introduction to hydrodynamics
[UCID-18014] N80-10471
Hydrodynamics of primordial black hole formation
[NASA-TM-75918] N80-10987
HYDROELASTICITY
Introduction to hydrodynamics
[UCID-18014] N80-10471
HYDROFLUORIC ACID
Measurements of anomalous dispersion of HF in absorption
[AD-A071004] N80-10331
HYDROFOILS
Leading edge flutter of a supercavitating hydrofoil
N80-10403
HYDROGEN
Hydrogen diffusion and trapping in bcc and fcc metals
[BNL-26132] N80-10936
Production of hydrogen, deuterium, and helium by 15-MeV neutrons
[COO-2719-5] N80-10873
HYDROGEN FUELS
A two-dimensional model of the interaction of a transverse jet in a supersonic stream with application to supersonic combustion
N80-10528
Survey of liquid hydrogen container techniques for highway vehicle fuel system applications
[HCP/M2752-01] N80-10383
Applications analysis of fixed site hydrogen storage
[SAND-78-8272] N80-10384
Hydrogen as a fuel. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0771/0] N80-10397
HYDROGEN PRODUCTION
Start up system for hydrogen generator used with an internal combustion engine
[NASA-CASE-NPO-13849-1] N80-10374
Hydrogen production. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0773/6] N80-10401
One- and two-dimensional heating analyses of fusion synfuel blankets
[BNL-NUREG-25635] N80-10922
HYDROGEN-BASED ENERGY
Hydrogen storage as a hydride. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0772/8] N80-10402
HYDROGENATION
Fuels by algae hydrogenation
N80-10375
HYDROGEOLOGY
Detection of a probable ancestral delta of the Nile River
N80-10571
HYDROGRAPHY
Hydrographic observations in the Georgia Bight, July 1977
[PB-297133/6] N80-10742
Circulation and hydrography near Kodiak Island, September to November 1977
[PB-297421/0] N80-10743
HYDROLOGY
South American river morphology and hydrology
N80-10574
Snow hydrology studies
N80-10575
Hydrologic modeling and data requirements for analysis of urban streamflow management alternatives
[PB-296499/7] N80-10591
HYDROPLANING
Transient aspect of hydroplaning: Hydroplaning phenomenon during sudden changes in the fluid layer on a pavement — effect of fluid films on tires on a highway
N80-10448
HYDROSTATICS
Dynamic characteristics of liquid film in hybrid hydrostatic bearing
N80-10005
HYDROTHERMAL CRYSTAL GROWTH
Growth of bismuth tungstate single crystals — hydrothermal crystal growth of single crystals
[COO-1198-1261] N80-10940
HYPERSONIC FLIGHT
Hypersonic propulsion — supersonic combustion ramjet engines
N80-10217
HYPERSONIC WIND TUNNELS
Development of an air heater for a mixture formation test rig — heating equipment for heat generation in hypersonic wind tunnels
[RAE-TRANS-2012] N80-10232
HYPOKINESIA
Roentgenological examination of the human heart after 180-day hypokinesia
N80-10759
Reactions of rats to overheating following prolonged hypokinesia
N80-10761
Effect of hypokinesia on higher nervous activity of albino rats
N80-10762
The combined effect of carbon monoxide and hypokinesia
N80-10763
Levels and proportion of RNA and proteins in the system of the neuron: Vestibular nuclear neuroglia and cerebellum during hypokinesia
N80-10764
HYPOTHESES
A memory retrieval aid for hypothesis generation
[AD-A072657] N80-10795
HYPOXIA
Effect of hypoxia on fluid-electrolyte metabolism and renal function in man as related to different degrees of motor activity
N80-10754
Effect of hypoxia on ATPase activity of the brain
N80-10776
Pulmonary adaptation to high altitude
[AD-A068317] N80-10784
Effect of a rapid 4 percent carboxyhemoglobin saturation increase on maximal treadmill exercise
[PB-296627/3] N80-10786

I

ICEBERGS
Long-term tracking of arctic icebergs
[AD-A072473] N80-10583
IDENTIFYING
Maximum likelihood identification of linear discrete stochastic systems — estimating and parameter identification in stochastic processes
[AD-A072147] N80-10229
IGNITERS
Propellant igniter development problems
N80-10289
Some measurements of ignition delay and heat transfer with pyrogen igniters
N80-10290
IGNITION
On the question of selecting the characteristic quantity governing fuel self-ignition in a stream
N80-10008
Ignition and extinction of solid propellants
N80-10284
Ignition and extinction of solid rocket propellants
N80-10285
Modeling of flame properties of methanol
[UCRL-82434] N80-10385
ILLUMINATION
Thermal and lighting efficiency standards
[PB-297429/3] N80-10408
IMAGE CONTRAST
Coded aperture imaging: A comparison between Fresnel zone apertures and uniformly redundant array apertures
[SAND-78-1625] N80-10481
IMAGE ENHANCEMENT
Algorithm for enhancing low-contrast details in digital images
[UCID-18015] N80-10827
X-ray tomography by optical reconstruction from projections
N80-10903
IMAGE PROCESSING
Quasi-three-dimensional display of infrared radar images using range/intensity color mapping
[AD-A070671] N80-10417
A system for control structure implementation for image understanding
[AD-A071603] N80-10805
Application of a microprogrammed, bit slice microprocessor to the real time imaging tracker problem
[AD-A071630] N80-10807
Progressive refinement of raster images
[AD-A072517] N80-10823
Feedback systems for image acquisition and processing — imaging techniques and optical properties of feedback for image resolution
N80-10906
IMAGE RESOLUTION
Feedback systems for image acquisition and processing — imaging techniques and optical properties of feedback for image resolution
N80-10906
IMAGES
Educator's guide for Mission to Earth: LANDSAT views the world
[NASA-SP-360] N80-10537
IMAGING TECHNIQUES
Ultrasonic imaging as applied to non-destructive testing of rocket propellants
N80-10313
Study of the optimum charge-transfer image sensor — photoelectric radiation measuring instruments with bucket brigade devices for imaging techniques
N80-10431
Coded aperture imaging: A comparison between Fresnel zone apertures and uniformly redundant array apertures
[SAND-78-1625] N80-10481
Feedback systems for image acquisition and processing — imaging techniques and optical properties of feedback for image resolution
N80-10906
IMPACT ACCELERATION
An examination of statistical impact acceleration injury prediction models based on torque and force variables
[AD-A071625] N80-10746
IMPACT TESTS
Light airplane crash tests at three roll angles
[NASA-TP-1477] N80-10512
IMPULSE GENERATORS
Material response to 500 keV proton beams at intensities below 1 GW/cm2
[AD-A072416] N80-10520
IMPURITIES
Study of a tokamak cleaning method utilizing glow discharge
[ORNL-TR-4664] N80-10921
INCOMPRESSIBLE FLOW
Calculation of optimal coordinates for two-dimensional incompressible flow
N80-10094
Flow around axisymmetric bodies: The direct and inverse problems
N80-10100
A computational model for three-dimensional incompressible wall jets with large cross flow
N80-10115
INDEXES [DOCUMENTATION]
Energy information data base. Corporate author entries
[DOE/TIC-4585-R1-SUPPL-1] N80-10617
NSSDC data listing
[NASA-TM-80349] N80-10956
NASA authorization for fiscal year 1980. Part 4: Index
[GPO-51-336] N80-10964
NASA Tech Briefs Index, 1977, volume 2, numbers 1-4
[NASA-SP-5021(19)] N80-10968
INDICATING INSTRUMENTS
A new method of electric measurement of crack length
[RAE-TRANS-2016] N80-10517
INDIUM PHOSPHIDES
Electronic characteristics of 3 - 5 compounds — electrophysics study of atomic structures of gallium arsenides and indium phosphides
[AD-A071447] N80-10939
INDUSTRIAL ENERGY
Development of combustion data to utilize low Btu gases as industrial process fuels. Project 61004 special report no. 4: High-forward-momentum burner
[FE-2489-33] N80-10390
Department of Energy workshops on industrial energy conservation reporting
[DOE/CS-1830-T3] N80-10635
Solar generation of industrial steam. Innovative research program subtask
[COO-4546-9] N80-10656
Microwave heating: Industrial applications. Citations from the engineering data base
[NTIS/PS-79/0632/4] N80-10674
INDUSTRIAL SAFETY
A safety practices manual for the manufacturing, transportation, storage, and use of pyrotechnics
[PB-297807/0] N80-10799
Analysis of airborne particulates and human urine by inductively coupled plasma-atomic emission spectrometry
[PB-297775/9] N80-10787
INDUSTRIAL WASTES
Immobilization of hazardous residuals by encapsulation — using a polyester matrix
[PB-296642/2] N80-10897
INELASTIC COLLISIONS
Role of deep inelastic processes in nuclear physics: Experimental and theoretical aspects of deep inelastic reactions
[LBL-8936] N80-10895
INELASTIC SCATTERING
Intermediate energy, inelastic, and charge exchange nucleon-nucleus scattering
N80-10879
Role of deep inelastic processes in nuclear physics: Experimental and theoretical aspects of deep inelastic reactions
[LBL-8936] N80-10895

INEQUALITIES
Cutting planes from conditional bounds: A new approach to set covering
[AD-A072459] N80-10021

INERTIAL NAVIGATION
Integration of GPS with inertial navigation systems N80-10173

INFORMATION DISSEMINATION
The evolution of JTIDS N80-10179

JTIDS system overview N80-10180

Navigation architecture — JTIDS relative navigation system N80-10181

NASA Tech Briefs Index, 1978 — bibliography
[NASA-SP-5021(20)] N80-10967

NASA Tech Briefs Index, 1977, volume 2, numbers 1-4
[NASA-SP-5021(19)] N80-10968

INFORMATION MANAGEMENT
Computer mapping software and geographic data base development: Oak Ridge National Laboratory user experience
[CONF-780727-1] N80-10586

INFORMATION RETRIEVAL
A memory retrieval aid for hypothesis generation
[AD-A072657] N80-10795

Deductive planning and pathfinding for relational data bases
[AD-A070801] N80-10957

Effects of retrieval term specifically on information retrieval from computer-based intelligence systems
[AD-A072312] N80-10958

Summary of the Sandia Materials Information data bank — materials aging and compatibility data
[SAND-78-1961C] N80-10959

On the design of an interactive information retrieval program
[CONF-780990-1] N80-10960

Manual of documentation practices applicable to defence-aerospace scientific and technical information, volume 2
[AGARD-AG-235-VOL-2] N80-10961

INFORMATION SYSTEMS
JTIDS expendable/low cost terminal development N80-10187

JTIDS II/DTDMA tactical terminal N80-10191

INFORMATION THEORY
A Reed-Solomon decding program for correcting both errors and erasures N80-10234

Time series analysis by the maximum entropy method
[ORNL-5332] N80-10930

INFRARED LASERS
Multiple photon process in SF6 N80-10485

INFRARED RADIATION
An experimental investigation to determine the effect of window cooling by mass injection for the Shuttle Infrared Leeside Temperature Sensing (SILTS) experiment
[NASA-TM-80170] N80-10458

Mid-infrared optically pumped lasers
[LA-7331-MS] N80-10491

Frustrated total reflection polarizer for the infrared N80-10901

INFRARED REFLECTION
Frustrated total reflection polarizer for the infrared N80-10901

INGOTS
Silicon ingot casting heat exchanger method, multi-wire slicing, fixed abrasive slicing technique, phase 3
[NASA-CR-162398] N80-10598

INHOMOGENEITY
Electromagnetic scattering by a two-dimensional inhomogeneity due to an oscillating magnetic dipole
[LBL-8275] N80-10424

INJECTION LASERS
Optical-microwave interactions in semiconductor devices
[AD-A072539] N80-10487

INJECTORS
Study of self-oscillatory liquid film flow regime in coaxial air stream N80-10004

INJURIES
An examination of statistical impact acceleration injury prediction models based on torque and force variables
[AD-A071625] N80-10746

INLET FLOW
An efficient user-oriented method for calculating compressible flow in an about three-dimensional inlets — panel method
[NASA-CR-159578] N80-10134

Computational fluid mechanics of internal flow N80-10211

INORGANIC COMPOUNDS
Electron transfer in a superdense nondegenerate plasma
[UCRL-TRANS-11473] N80-10924

INSOLATION
A thermal vegetation canopy model of sensor response N80-10535

Graphical representation of TMY solar radiation availability for one- and two-axis solar collectors
[SAND-79-0418] N80-10640

INSTRUMENT LANDING SYSTEMS
Algorithms and logic for incorporating ILS NASA TCV B-737 airplane area navigation system
[NASA-TM-80167] N80-10152

INSULATION
Implications of possible shuttle charging — prediction analysis techniques for insulation and electrical grounding against ionospheric conductivity
[NASA-CR-161283] N80-10277

INSULATORS
Theory of phonon echoes in insulators — time functions of sound waves N80-10858

INTAKE SYSTEMS
Passive propellant system
[NASA-CASE-MFS-23642-1] N80-10278

INTEGRAL EQUATIONS
On minimizing integral quadratic estimates N80-10051

Integral solutions of the high Reynolds number small separation problem N80-10099

INTEGRATED CIRCUITS
Density and reliability predictions for a general logic structure for custom LSI N80-10250

Joint services electronics program — a bibliography with abstracts
[AD-A072076] N80-10438

Strip transmission lines, volume 2. Citations from the NTIS data base — bibliography with abstracts
[NTIS/PS-79/0618/3] N80-10447

Strip transmission lines. Volume 3: Citations from the engineering index data base
[NTIS/PS-79/0620/9] N80-10446

Strip transmission lines. Volume 2: Citations from the engineering index data base N80-10447

Fiber optics transmitter integrated circuit development
[AD-A071437] N80-10909

INTEGRATED ENERGY SYSTEMS
Steam turbines — thermoelectric power generation
[ANL/CES/TE-78-7] N80-10982

The first small power system experiment, Phase 1: Engineering experiment no. 1 — solar thermal electric power plants
[NASA-CR-162417] N80-10596

Modeling approach suitable for energy system
[CONF-790459-4] N80-10632

INTERFACIAL TENSION
Passive propellant system
[NASA-CASE-MFS-23642-1] N80-10278

INTERFEROMETRY
Material response to 300 keV proton beams at intensities below 1 GW/cm2
[AD-A072416] N80-10520

INTERIOR BALLISTICS
Propellant driven turbulent interior ballistics and wall erosion
[UCRL-81289] N80-10279

Internal ballistic problems of Helmut highly accelerated solid propellant rockets N80-10288

INTERMETALLICS
Alloys obtained in a state of weightlessness N80-10270

INTERMODULATION
Use of predistortion to reduce intermodulation distortion in optical fiber communication sources
[AD-A072637] N80-10910

INTERNAL COMBUSTION ENGINES
Start up system for hydrogen generator used with an internal combustion engine
[NASA-CASE-NPO-13849-1] N80-10374

Energy storage systems for automobile propulsion, 1978 study. 1: Overview and findings
[UCRL-52553-VOL-1] N80-10970

INTERNAL FRICTION
Study of internal friction in single crystal silicon N80-10928

INTERNAL WAVES
Observations of internal-wave surface signatures in ASTP photographs N80-10570

INTERSTELLAR GAS
Non-equilibrium processes in interstellar molecules
[NASA-TM-75685] N80-10981

INTERSTELLAR MASERS
Non-equilibrium processes in interstellar molecules
[NASA-TM-75685] N80-10981

INTERSTELLAR MATTER
Non-equilibrium processes in interstellar molecules
[NASA-TM-75685] N80-10981

INVENTORY MANAGEMENT
Factors affecting the retirement of commercial transport jet aircraft
[NASA-CR-152308] N80-10148

INVISCID FLOW
Study of radial diffusers with flow swirl — profile of a vaneless diffusion in a compressible inviscid flow N80-10025

Viscid/inviscid interaction analysis of thrust augmenting ejectors N80-10112

ION BEAMS
Development and testing of a three-stage double tandem accelerator-decelerator system for low energy, highly stripped ions
[COO-4257-3] N80-10878

Proposal for the theoretical investigation of light-ion beam propagation through a residual plasma environment — for inertial confinement fusion reactors
[LA-7990-P] N80-10911

IONIC COLLISIONS
Microscopic classical equations of motion calculations of high-energy heavy-ion collisions N80-10880

IONIZATION
Theory of electron transfer and ionization
[CONF-790438-1] N80-10876

Electron transfer in a superdense nondegenerate plasma
[UCRL-TRANS-11473] N80-10924

IONIZATION CROSS SECTIONS
Electron excitation cross sections for multiply charged ions
[ORO-4881-23] N80-10868

IONIZING RADIATION
A method of defining the optimum level of ionizing radiation from determinate sources during space flights N80-10770

IONOSPHERE
Numerical modeling of stimulation of induced magnetosphere during interaction of solar wind with the ionosphere of Venus
[NASA-TM-75921] N80-10990

IONOSPHERIC CONDUCTIVITY
Implications of possible shuttle charging — prediction analysis techniques for insulation and electrical grounding against ionospheric conductivity
[NASA-CR-161283] N80-10277

IONS
Electron excitation cross sections for multiply charged ions
[ORO-4881-23] N80-10868

Ion acceleration at the earth's bow shock: A review of observations in the upstream region
[LA-UR-79-309] N80-10984

IRAN
Analysis and synthesis of space imagery of the southeastern-Turkey/northwestern-Iran mobile belt N80-10544

IRON ALLOYS
Constant and variable loading fatigue strength of black-heart malleable cast iron regarding metallurgical characteristics
[ICAF-1009] N80-10511

Magnetic order in gold-iron alloys
[UCRL-52636] N80-10942

IRRADIATION
Tensile properties of type 316 stainless steel irradiated in a simulated fusion reactor environment
[CONF-790125-50] N80-10355

Application of microwave energy to post-calcination treatment of high-level nuclear wastes — pellet drying and glass vitrification
[ICP-1183] N80-10889

Sandia irradiator for Dried Sewage Solids
[SAND-79-0182] N80-10971

ISOMERS
An experimental investigation of angular effects on the Mossbauer linebreadth and time domain analysis of Mossbauer line broadening N80-10926

ISOTOPE SEPARATION
The jet membrane process for uranium separation and enrichment
[RE-586] N80-10329

ITALY
Volcanic landforms and astroblemes N80-10551

ITERATION
The Martin-Lomax iteration for the computations of transonic flow fields: Some observations
[AD-A072523] N80-10141

J

JACOBI MATRIX METHOD
Matrix inverse eigenvalue problem for periodic Jacobi Matrices
[STAN-CS-78-684] N80-10855

JAMMING
Integration of GPS with inertial navigation systems N80-10173

Research on adaptive antenna techniques 2
[AD-A071338] N80-10419

JET AIRCRAFT
Factors affecting the retirement of commercial transport jet aircraft
[NASA-CR-152308] N80-10148
Analysis of the response of a thermal barrier coating to sodium and vanadium doped combustion gases
[NASA-TM-79205] N80-10344
JET AIRCRAFT NOISE
The effect of the duration of jet aircraft flyover sounds on judged annoyance — noise predictions and noise measurements of jet aircrafts and human reactions to the noise intensity
[NASA-CR-159132] N80-10039
JET ENGINE FUELS
Alternative jet aircraft fuels
N80-10209
JET ENGINES
VSCE technology definition study
[NASA-CR-159730] N80-10222
JET EXHAUST
Considerations of some critical ejector problems — for the V/STOL aircraft
N80-10127
JET FLAPS
Internal-external flow integration for a thin ejector-flapped wing section
N80-10113
JET FLOW
Parametric method of aircraft engine status diagnostics based on limited information
N80-10003
Determination of turning angle of a jet impinging on a bucket with visor
N80-10011
Experimental study of the turbulent wake downstream of a fan jet
N80-10018
Study of mass exchange between primary zone and secondary air jets in gas turbine engine combustion chambers
N80-10075
Linearized unsteady jet analysis
N80-10118
An investigation of corner separation within a thrust augmentor having Coanda jets
[NADC-76153-30] N80-10122
Pressure and velocity measurements in a three-dimensional wall jet
N80-10126
JET MIXING FLOW
Influence of gas turbine engine combustion chambers geometric parameters on mixture formation characteristics
N80-10006
On the flame stabilization mechanism in two-phase fuel-air mixture flow
N80-10013
Large-scale turbulent structures in jets and in flows over cavities and their relationship to entrainment and mixing
N80-10123
A two-dimensional model of the interaction of a transverse jet in a supersonic stream with application to supersonic combustion
N80-10328
JET PUMPS
Improved RELAP4 jet pump model
[CAAP-TR-046] N80-10580
JOINTS (JUNCTIONS)
Longitudinal joint systems in slip-formed rigid pavements. Volume 1: Literature survey and field inspection
[AD-A066320] N80-10230
Nonlinear inelastic stability of flexibly-connected plane steel frames
N80-10508
State-of-the-art survey of joinability of materials for OTEC heat exchangers
[ORNL/TM-6284] N80-10647
JOURNAL BEARINGS
Dynamic characteristics of liquid film in hybrid hydrostatic bearing
N80-10005

K

KEROSENE
Dynamics of diesel fuel combustion in turbulent flow
N80-10074
KEVLAR (TRADEMARK)
Accelerated aging of parachute materials
[SAND-79-0894C] N80-10144
KINEMATICS
An investigation into the combined isotropic-kinematic workhardening rule
[AD-A072152] N80-10524
KNOWLEDGE
A study of complex learning theory and methodologies
[AD-A068323] N80-10792
KOLMOGOROFF-SMIRNOFF TEST
Limit distributions of Kolmogorov-Smirnov type statistics under a fixed alternative with estimated location and scale parameters
[AD-A072159] N80-10847

L

LAGRANGE MULTIPLIERS
A restricted lagrangean approach to the traveling salesman problem
[AD-A072457] N80-10837
LAKES
Some steady state exact solutions of the wind-driven circulation equations for a rigid-lid shallow lake
[PB-297206/5] N80-10589
LAMINAR BOUNDARY LAYER
On the laminar boundary on the surface of a cylinder moving in a fluid
N80-10036
Laminar boundary layer calculation from experimental pressure distribution
N80-10045
Approximate calculation of the laminar boundary layer in micronozzles
N80-10076
LAMINAR FLOW
The turbulent boundary layer on a curvilinear surface
N80-10020
Calculation of optimal coordinates for two-dimensional incompressible flow
N80-10094
Some measurements in synthetic turbulent boundary layers — over flat plates in turbulent and laminar flow
N80-10095
Re-establishment of laminar flow on a Heated Submerged Vehicle
[AD-A072566] N80-10463
LAMINATES
The scatter of mechanical values of carbon fiber composites and its causes — statistical values of strength
[NASA-TM-75698] N80-10317
LANCE MISSILE
The 12823AT lance, missile number 3382, round number 327 ECL 8 March 1979
[AD-A070557] N80-10724
The 12823A lance missile number 4724 round number 332 NCL
[AD-A072044] N80-10738
LAND MANAGEMENT
Mineral resources and land-use planning, the Watkins, Colorado case: A workshop synopsis
[ANL/LRP/TM-7] N80-10585
LAND USE
Growing energy: Land for biomass farms
[PB-296630/5] N80-10400
Mineral resources and land-use planning, the Watkins, Colorado case: A workshop synopsis
[ANL/LRP/TM-7] N80-10585
LANDSAT project, State of Hawaii: A preliminary report
[PB-296712/3] N80-10587
LANDING GEAR
Application of the factor interpolation method in flight vehicle landing gear analytic design
N80-10058
LANDING SIMULATION
Pilot performance during simulated approaches and landings made with various computer-generated visual glidepath indicators
[AD-A066220] N80-10151
LANDSAT SATELLITES
Cluster analysis based on density estimates and its application to landsat imagery
N80-10533
Educator's guide for Mission to Earth: LANDSAT views the world
[NASA-SP-360] N80-10537
LANDSAT project, State of Hawaii: A preliminary report
[PB-296712/3] N80-10587
On the consistency of the maximum likelyhood estimate of normal mixture parameters for a sample with field structure
[NASA-CR-160352] N80-10836
LASER ANEMOMETERS
Gas phase velocity measurements in solid rocket propellants by Laser Doppler anemometry
N80-10311
LASER APPLICATIONS
DARPA-NRL laser program
[AD-A072359] N80-10489
LASER DOPPLER VELOCIMETERS
Laser Doppler Velocimeter (LDV) study of secondary flows in turbine cascade
N80-10090
Gas phase velocity measurements in solid rocket propellants by Laser Doppler anemometry
N80-10311
LASER PLASMA INTERACTIONS
A study of soft X-ray laser schemes in multi-component laser plasmas — population inversions from laser plasma interactions
N80-10913
LASER PLASMAS
A study of soft X-ray laser schemes in multi-component laser plasmas — population inversions from laser plasma interactions
N80-10913
LASER RANGE FINDERS
A performance evaluation of mini-laser cartridge devices
[AD-A072505] N80-10488
LASER SPECTROSCOPY
Nonlinear spectroscopy
[AD-A071282] N80-10334
Scalar diffraction analysis of light scattering by epithelial cells from a line focused laser beam
N80-10484
LASERS
Mid-infrared optically pumped lasers
[LA-7331-MS] N80-10491
Diffraction measurements for LASL's Antares laser system
[LA-7443-MS] N80-10492
LATERAL CONTROL
Flying qualities research for highly augmented aircraft
[RE-582] N80-10194
LATERAL STABILITY
Comparison of stability and control parameters for a light, single-engine, high-winged aircraft using different flight test and parameter estimation techniques
[NASA-TM-80163] N80-10225
LATEX
Molten salt pyrolysis of latex — for hydrocarbon fuel production
[NASA-CASE-NPO-14315-1] N80-10361
LATTICE PARAMETERS
Structure solution methods for superstructures
[CONF-790342-1] N80-10945
LATTICE VIBRATIONS
Transients in vibrational relaxation of polyatomic molecules at high temperatures by the variable exchange method
[AD-A070774] N80-10867
LAUNCHING
Application of GPS to low cost tactical weapons
N80-10174
LAUNCHING SITES
The 12823AT lance, missile number 3382, round number 327 ECL 8 March 1979
[AD-A070557] N80-10724
The 19702A GSRS, missile number N/A, round number B-6/B-7, 26 March 1979
[AD-A070556] N80-10725
LAW (JURISPRUDENCE)
Dimensions/NBS, volume 63, no. 6, June 1979
[PB-297836/9] N80-10975
LEAD (METAL)
Lead batteries, volume 1. Citations from the engineering index data base
[NTIS/PS-79/0781/9] N80-10680
Lead batteries, volume 2. Citations from the engineering index data base
[NTIS/PS-77/0634] N80-10681
Lead batteries. Citations from the NTIS data base
[NTIS/PS-79/0700/1] N80-10682
LEADING EDGE SLATS
Two-dimensional flow past convex and concave corners at transonic speed and two-dimensional flow around a parabolic nose at subsonic and transonic speeds
N80-10092
LEADING EDGES
Estimation of attainable leading-edge thrust for wings at subsonic and supersonic speeds
[NASA-TP-1500] N80-10105
Leading edge flutter of a supercavitating hydrofoil
N80-10403
LEARNING
An aptitude-strategy interaction in linear syllogistic reasoning
[AD-A068498] N80-10791
A study of complex learning theory and methodologies
[AD-A068323] N80-10792
Remote operator performance comparing mono and stereo TV displays: The effects of visibility, learning and task factors
[AD-A068201] N80-10793
Modality effects in scanning nonverbal information: Evidence for multiple memory codes
[AD-A072297] N80-10796
LEAST SQUARES METHOD
Field state estimation by least squares
N80-10040
LEGIBILITY
An improved FORTRAN reorganizer
[AD-A071334] N80-10822

LENS DESIGN
Design, engineering, and manufacturing aspects of gradient index optical components — lens design using aberration coefficients for gradient lens
N80-10900

LENSES
Design, engineering, and manufacturing aspects of gradient index optical components — lens design using aberration coefficients for gradient lens
N80-10900

LEPTONS
Heavy lepton phenomenology
[SLAC-PUB-2219] N80-10083

LIAPUNOV FUNCTIONS
Lyapunov stability and its application to systems of ordinary differential equations
[NASA-TM-80806] N80-10835

LIBYA
Volcanic landforms and astroblemes
N80-10551

LIFE (DURABILITY)
Accelerated aging of parachute materials
[SAND-79-0896C] N80-10144

LIFE CYCLE COSTS
Phase 2 GPS receiver design philosophy
N80-10171

LIFE SUPPORT SYSTEMS
Extended duration orbiter study: CO2 removal and water recovery
[NASA-CR-160317] N80-10800

LIFT AUGMENTATION
An overview of current Navy programs to develop thrust augmenting ejectors
N80-10110

LIGHT (VISIBLE RADIATION)
Quantum electrodynamics and light rays
[ORO-3992-354] N80-10949

LIGHT AIRCRAFT
Structural stiffening as an interior noise control technique for light twin-engine aircraft
N80-10192

Comparison of stability and control parameters for a light, single-engine, high-winged aircraft using different flight test and parameter estimation techniques
[NASA-TM-80163] N80-10225

LIGHT BEAMS
The spherical wave phase difference temporal power spectra for light beams degraded by a turbulent atmosphere
N80-10898

LIGHT SCATTERING
Scalar diffraction analysis of light scattering by epithelial cells from a line focused laser beam
N80-10484

LIMITS (MATHEMATICS)
Mixing conditions and limit theorems for maxima of some stationary sequences
[COO-2874-38] N80-10844

LINE SHAPE
Analysis and computerized fitting of the lineshape of the NMR powder pattern
[IS-4516] N80-10874

LINE SPECTRA
An experimental investigation of angular effects on the Mossbauer linebreadth and time domain analysis of Mossbauer line broadening
N80-10926

LINEAR SYSTEMS
Linearized unsteady jet analysis
N80-10118

Maximum likelihood identification of linear discrete stochastic systems — estimating and parameter identification in stochastic processes
[AD-A072147] N80-10229

The design of an optimal observer for linear discrete time dynamical systems — designing airdar tracking system
[AD-A072066] N80-10422

Frequency-domain approaches to linear multivariable control systems design — control theory and mathematical models for linear frequency control systems
N80-10432

Generating covariance sequences and the calculation of quantization and rounding error variances in digital filters
[AD-A072077] N80-10838

LINEAR TRANSFORMATIONS
Use of the method of variable directions for numerical study of the temperature states of a turbine disk with blades — temperature distribution of rotating disk turbine blades using linear transformation
N80-10029

LINEARIZATION
Most rational linearization of nonlinear unsteady heat conduction problems
N80-10012

LIPIDS
Rush nuts (Cyperus esculentus) as a source of vegetable oil in a closed life support system
N80-10789

LIQUEFIED NATURAL GAS
The impact of LNG spills on the environment: A comparison of dispersion models and experimental data
[UCRL-81812] N80-10488

LIQUID BEARINGS
Dynamic characteristics of liquid film in hybrid hydrostatic bearing
N80-10005

LIQUID CRYSTALS
Physics of mesomorphic compounds — cholesteric liquid crystal
[AD-A070539] N80-10935

Liquid crystals, volume 1. A bibliography with abstracts
[NTIS/PS-79/0795/9] N80-10947

Liquid crystals, volume 2. A bibliography with abstracts
[NTIS/PS-79/0796/7] N80-10948

LIQUID FLOW
Study of self-oscillatory liquid film flow regime in coaxial air stream
N80-10004

Liquid ejector with perforated nozzle
N80-10072

LIQUID HELIUM
Experimental investigation of first and second-sound shock waves in liquid helium II
N80-10451

LIQUID HYDROGEN
Survey of liquid hydrogen container techniques for highway vehicle fuel system applications
[HCP/M2752-01] N80-10383

Hydrogen production. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0773/6] N80-10401

LIQUID INJECTION
Sodium storage and injection system
[NASA-CASE-NPO-14384-1] N80-10494

LIQUID METALS
Performance limits for liquid-metal heat pipes containing long adiabatic sections
[LA-UR-79-1241] N80-10472

LIQUID OXYGEN
Photographic combustion characterization of LOX/hydrocarbon type propellants
[NASA-CR-160318] N80-10378

LIQUID PHASES
Investigation of the T sub II [T sub g] relaxation of homopolymers and block copolymers of styrene by torsional braid analysis
[AD-A072075] N80-10363

LIQUID PROPELLANT ROCKET ENGINES
On stability of operation of Liquid Rocket Engine with Turbopump Assembly [TPA]
N80-10034

Measurement of liquid pump torque in the starting regime
N80-10066

Warmup of LRE chambers with regenerative cooling
N80-10087

LIQUID ROCKET PROPELLANTS
Passive propellant system
[NASA-CASE-MFS-23642-1] N80-10278

Photographic combustion characterization of LOX/hydrocarbon type propellants
[NASA-CR-160318] N80-10378

LIQUID SODIUM
Sodium storage and injection system
[NASA-CASE-NPO-14384-1] N80-10494

LIQUID WASTES
High energy electron radiation of wastewater liquid residuals
[PB-297593/6] N80-10976

LIQUID-LIQUID INTERFACES
Mass transfer and liquid-liquid dispersion in agitated vessels — mass transfer coefficients and drop size in soluble liquid-liquid interfaces after mixing
N80-10449

LIQUID-SOLID INTERFACES
Self-similar solutions in the destruction and melting problem with account for abrupt density change — heat transfer problems for composite thermoprotective coatings
N80-10041

LITHIUM
Lithium batteries. Volume 3: Citations from the NTIS data base
[NTIS/PS-79/0675/3] N80-10672

LITHIUM CHLORIDES
Analysis of a LiCl open-cycle absorption air conditioner which utilizes a packed bed for regeneration of the absorbent solution driven by solar heated air
[COO-4546-1] N80-10652

LITHIUM ISOTOPES
Study of structure of light nuclei with neutrons
[COO-2490-9] N80-10872

LITHIUM SULFUR BATTERIES
Lithium batteries: Citations from the Engineering Index data base
[NTIS/PS-79/0676/1] N80-10666

Lithium batteries. Volume 2: Citations from the NTIS data base
[NTIS/PS-79/0674/6] N80-10671

Lithium batteries. Volume 3: Citations from the NTIS data base
[NTIS/PS-79/0675/3] N80-10672

LIVER
Ultrastructural changes in canine hepatocytes during continuous chronic exposure to low doses of gamma radiation
N80-10768

LOADS (FORCES)
Dynamic characteristics of liquid film in hybrid hydrostatic bearing
N80-10005

On the empennage snap-through problem
N80-10047

Creep analysis of thin-wall structures subject to transient heating and loading
N80-10052

Unloading the drive of gas distributor valves operating at high pressures
N80-10081

A literature search and review of the dynamics of aircraft-surface interaction
[AD-A070940] N80-10199

Collapse load analysis for plates and shells
[AD-A071649] N80-10518

Vibration frequencies of an arch model under various loading conditions
[PB-297987/0] N80-10529

LOGIC DESIGN
Algorithms and logic for incorporating ILS NASA TCV B-737 airplane area navigation system
[NASA-TM-80167] N80-10152

LONGITUDINAL CONTROL
Analytic design of regulators for controlling elastic flight vehicle rotation about the longitudinal axis
N80-10035

LONGITUDINAL STABILITY
Comparison of stability and control parameters for a light, single-engine, high-winged aircraft using different flight test and parameter estimation techniques
[NASA-TM-80163] N80-10225

LOW ALTITUDE
Aircraft measurements of micrometeorological parameters at Panama City, Florida, in 1978
[AD-A070956] N80-10737

LOW COST
JTIDS expendable/low cost terminal development
N80-10187

LOW FREQUENCIES
JTIDS: The issue of frequency selection — low frequency assignment for pulse communication navigation aids
N80-10183

LOW SPEED
Low-speed wind-tunnel tests of a 1/10-scale model of an advanced arrow-wing supersonic cruise configuration designed for cruise at Mach 2.2 — Langley Full Scale Wind Tunnel
[NASA-TM-80152] N80-10135

A low velocity water tunnel for biological research
N80-10271

LOW SPEED WIND TUNNELS
Cryogenic wind tunnel activities at the University of Southampton — flow visualization technique for low speed wind tunnel tests
[NASA-CR-159144] N80-10231

LOW TEMPERATURE PHYSICS
Electron-dislocation interaction at low temperatures — metal crystals and superconductivity
[COO-2305-6] N80-10943

LUBRICANT TESTS
Mechanism of turbine engine lubricant deposition
[AD-A072557] N80-10223

LUBRICANTS
Dynamic characteristics of liquid film in hybrid hydrostatic bearing
N80-10005

Mechanism of turbine engine lubricant deposition
[AD-A072557] N80-10223

LUBRICATING OILS
Study of size distribution of oil drops formed in GTE oil
N80-10088

LUBRICATION
Design criteria for dry lubricated flight control bearings — wear tests to make design analysis and check equipment specifications
[AD-A071322] N80-10228

LUBRICATION SYSTEMS
Study of size distribution of oil drops formed in GTE oil
N80-10088

LUMINOUS INTENSITY
Results and interpretation of measurements of the light flux in the near-surface layer of the Venusian atmosphere
[NASA-TM-75716] N80-10908

LUNAR CRUST
Lunar crustal magnetic anomalies detected by the Apollo subsatellite magnetometers
N80-10985

LUNAR RADAR ECHOES
Lunar radar backscatter studies
[NASA-CR-162415] N80-10906

LUNGS
The extended Kalman filter as pulmonary blood flow estimator
N80-10779

M

MACHINING
Preliminary machining study on Fluorotuoryflate laser glass
[UCID-18201] N80-10493
MAGNETIC ANOMALIES
Lunar crustal magnetic anomalies detected by the Apollo subsatellite magnetometers
N80-10983
MAGNETIC CONTROL
Study of periodic motions of a satellite with a magnetic damper
[NASA-TM-75667] N80-10273
MAGNETIC DIPOLES
Electromagnetic scattering by a two-dimensional inhomogeneity due to an oscillating magnetic dipole
[LBL-8275] N80-10424
MAGNETIC FIELDS
Electromagnetic fields of underground antennas — electromagnetic properties of directional antennas in electric fields and magnetic fields
N80-10412
Magnetic field studies of electronic Raman scattering in rare-earth rimmers
N80-10930
MAGNETIC PROPERTIES
Magnetic order in gold-iron alloys
[UCRL-52636] N80-10942
MAGNETIC STORMS
Study to analyze and synthesize satellite data
[AD-A070947] N80-10712
Magnetic potential plots over the northern hemisphere for 26-28 March 1976
[PB-297195/0] N80-10718
MAGNETIC VARIATIONS
Magnetic and superconducting transitions in the rare earth rhodium boride compounds
N80-10927
MAGNETICALLY TRAPPED PARTICLES
Flow on magnetizable particles in turbulent air streams
[NASA-CR-163418] N80-10461
Computer simulation of kinetic properties of plasma — magnetic fusion energy
[COO-2280-10] N80-10920
MAGNETO-OPTICS
Magneto-optical studies of paramagnetic systems to determine their potential for use as continuously tunable coherent far-infrared sources
N80-10899
MAGNETOHYDRODYNAMIC FLOW
Establishment of the spectra of kinetic turbulence
[NASA-TM-75666] N80-10914
MAGNETOHYDRODYNAMICS
NASA-Lewis closed-cycle magnetohydrodynamics plant analysis
[NASA-TM-79249] N80-10595
Physical experiments on the theta pinch
[NASA-TM-75694] N80-10915
MAGNETOMETERS
Lunar crustal magnetic anomalies detected by the Apollo subsatellite magnetometers
N80-10983
MAGNETOSONIC RESONANCE
Fast magnetosonic wave heating of the NUWMAK tokamak reactor
[UWFDM-227] N80-10923
MAGNETOSPHERE
Magnetopause layer and plasma boundary layer of the magnetosphere
[LA-UR-78-2992] N80-10715
Saturn's magnetosphere, rings, and inner satellites
[U-OF-SOWA-79-44] N80-10987
Numerical modeling of stimulation of induced magnetosphere during interaction of solar wind with the ionosphere of Venus
[NASA-TM-75921] N80-10990
MALES
Revised height/weight sizing programs for men's protective flight garments
[AD-A070732] N80-10003
MALTA
Maltese Front and Strait of Sicily ocean pattern analysis
N80-10565
MAN MACHINE SYSTEMS
Design considerations for the man-machine subsystem user interface to TAS
[AD-A071207] N80-10002
Progressive refinement of raster images
[AD-A072517] N80-10823
Principles of ergonomic standards discussed
N80-10998
MANAGEMENT INFORMATION SYSTEMS
Computer systems conversion: A management perspective
[PB-297604/1] N80-10832
Manual of documentation practices applicable to defense-aerospace scientific and technical information, volume 2
[AGARD-AG-233-VOL-2] N80-10961
MANAGEMENT METHODS
Subgroup report on alternative technology strategies for the isolation of nuclear waste
[TID-28818] N80-10883
MANAGEMENT PLANNING
Assessment of synfuel transportation to year 2000
[PNL-2768] N80-10382
The requirements and feasibility of business planning in the office of space and terrestrial applications
[NASA-CR-162380] N80-10832
Managerial plan: Executive order 12003 and the National Energy Act
[DOE/TIC-10067] N80-10965
MANEUVERABILITY
Maneuver limitations of combat aircraft
[AGARD-AR-155A] N80-10280
MANNED SPACE FLIGHT
Problems of pharmacology in space medicine
N80-10749
Health prognosis in flight discussed
N80-10995
MANUFACTURING
Energy and economic assessment of anaerobic digesters and biofuels for rural waste management
[PB-296523/4] N80-10398
MANY BODY PROBLEM
Modified method of perturbed stationary states I
[SAND-78-0235] N80-10893
MAPPING
Quasi-three-dimensional display of infrared radar images using range/intensity color mapping
[AD-A070671] N80-10417
Regional geochemical exploration for mineral deposits in the appalachians of central and northwestern Virginia
N80-10534
Human factors in the design and evaluation of aviation maps
[AGARD-AG-225] N80-10536
Computer mapping software and geographic data base development: Oak Ridge National Laboratory user experience
[CONF-780727-1] N80-10586
MAPS
Strip trees: A hierarchical representation for map features
[AD-A071124] N80-10582
Magnetic potential plots over the northern hemisphere for 26-28 March 1976
[PB-297195/0] N80-10718
MARAGING STEELS
Fatigue crack propagation in high alloy and corrosion resistant (stainless) steel plate, bar and forgings
[ESDU-79003] N80-10341
MARINE BIOLOGY
A low velocity water tunnel for biological research
N80-10271
Metabolic responses of shallow tropical benthic microcosm communities to perturbation
[PB-298243/7] N80-10744
MARINE METEOROLOGY
Mesoscale cloud patterns revealed by ASTP photographs
N80-10576
Analysis of statistical parameters from satellite digital data, July 1978 GOES-west, for use in diagnosing marine fog
[AD-A072145] N80-10725
MARINE RESOURCES
Minerals for deep-sea exploration
N80-10999
MARKET RESEARCH
Cargo Logistics Airlift Systems Study [CLASS]. Volume 4: Future requirements of dedicated freighter aircraft to year 2000
[NASA-CR-158950-VOL-4] N80-10149
Energy supply and demand in the midterm: 1985, 1990, and 1995
[DOE/EIA-0102/32] N80-10620
A study of the cost-effective markets for new technology agricultural aircraft
[NASA-CR-159090] N80-10962
MARS ATMOSPHERE
On the structure of the upper atmosphere of Mars according to data from experiments on the Viking space vehicles
[NASA-TM-75717] N80-10989
MASS FLOW
An experimental investigation to determine the effect of window cooling by mass injection for the Shuttle Infrared Leeside Temperature Sensing [SILTS] experiment
[NASA-TM-80170] N80-10458
MASS RATIOS
Observations on parachute scale factors for modeling parachute deployment and steady state performance
[AD-A070571] N80-10138
MASS SPECTRA
Electronic reduction of high speed mass spectral data
[SAND-79-0709] N80-10336
MASS SPECTROSCOPY
Photoionization mass spectrometric studies of selected compounds in a molecular beam
[LA-7727-T] N80-10333
Analysis of organic air pollutants by gas chromatography and mass spectroscopy
[PB-296035/2] N80-10899
MASS TRANSFER
Generalized heat and mass transfer law for internal flows
N80-10073
Study of mass exchange between primary zone and secondary air jets in gas turbine engine combustion chambers
N80-10075
Mass transfer and liquid-liquid dispersion in agitated vessels — mass transfer coefficients and drop size in soluble liquid-liquid interfaces after mixing
N80-10449
MASSACHUSETTS
Analysis of water color as seen in orbital and aerial photographs of Cape Cod, Nantucket, and Martha's Vineyard, Massachusetts
N80-10567
MATERIALS HANDLING
Assessment of synfuel transportation to year 2000
[PNL-2768] N80-10382
Survey of liquid hydrogen container techniques for highway vehicle fuel system applications
[HCP/M2752-01] N80-10383
A safety practices manual for the manufacturing, transportation, storage, and use of pyrotechnics
[PB-297807/0] N80-10399
Risk analysis methodology and data: Study of alternatives for long-term management of Hanford defense high-level radioactive waste
[WSC-PS-ARH-77001] N80-10891
MATERIALS RECOVERY
Methane recovery from coalbeds
[DOE/MC-08089-T1] N80-10387
MATHEMATICAL MODELS
Parametric method of aircraft engine status diagnostics based on limited information
N80-10003
Mathematical models of the process of vibroabrasive grinding of parts with autonomous vibrations in the vibromachine container
N80-10023
Analytic representation of turbine characteristics in form convenient for computer calculation of GTE parameters
N80-10024
Mathematical model and stability of hydraulic servo drive with jet-throttle regulation
N80-10033
Application of the factor interpolation method in flight vehicle landing gear analytic design
N80-10038
A computational model for three-dimensional incompressible wall jets with large cross flow
N80-10115
Math modeling and computer mechanization for real time simulation of rotary-wing aircraft
[NASA-CR-162408] N80-10137
Observations on parachute scale factors for modeling parachute deployment and steady state performance
[AD-A070571] N80-10138
A study to develop optimization algorithms for aircraft wing structures
[AD-A072668] N80-10196
DSS receiver thermal noise model comparisons
N80-10262
Modeling of flame properties of methanol
[UCRL-82434] N80-10385
Frequency-domain approaches to linear multivariable control systems designs — control theory and mathematical models for linear frequency control systems
N80-10432
Numerical simulation of dynamics of brushless dc motors for aerospace and other applications. Volume I: Model development and applications, part A
[NASA-CR-160349] N80-10437
Evaluation of a locally homogeneous flow model of spray evaporation
N80-10453
One-dimensional model of vapor generation in steady flashing flow
[BNL-NUREG-25616] N80-10468
Development of mathematical models to describe the wear process in viscoelastic materials
N80-10496
Coupled rotor and fuselage equations of motion
[NASA-TM-81153] N80-10516
Modeling approach suitable for energy system
[CONF-790439-4] N80-10632
Dynamics and control: Energy conversion, delivery, and demand analysis
[BNL-26045] N80-10633

Fabric filter model sensitivity analysis
[PB-297755/1] N80-10704
A model for auditory evoked potentials
N80-10780
Numerical experiments on the theta pinch
[NASA-TM-75694] N80-10915
An ac large signal model for the GaAs MESFET
[AD-A071663] N80-10936
Numerical modeling of stimulation of induced magnetosphere during interaction of solar wind with the ionosphere of Venus
[NASA-TM-75921] N80-10990

MATHEMATICAL PROGRAMMING
Theory of realizability for linearly elastic truss-structures and related applications in optimum structural design
N80-10509
Set covering algorithms using cutting planes, heuristics, and subgradient optimization: A computational study
[AD-A072458] N80-10820
A restricted lagrangean approach to the traveling salesman problem
[AD-A072457] N80-10837

MAXIMUM LIKELIHOOD ESTIMATES
On the consistency of the maximum likelyhood estimate of normal mixture parameters for a sample with field structure
[NASA-CR-160352] N80-10836

MEASURE AND INTEGRATION
Semiclassical quantization of Nonseparable Hamiltonian Systems — measure and integration of hamiltonian function in atomic physics
N80-10865

MEASURING INSTRUMENTS
Instrumentation technology
N80-10214
Borehole geological assessment
[NASA-CASE-NPO-14231-1] N80-10709

MECHANICAL DRIVES
Method for calculating optimal parameters of high-pressure pneumatic drives
N80-10870
Mechanical components
N80-10213

MECHANICAL PROPERTIES
Studies of chemical and mechanical surface phenomena by particle emission techniques
N80-10933

MEDICAL SCIENCE
National library of medicine toxicology data base management system
[ORNL/CSD/TM-80] N80-10785

MEDITERRANEAN SEA
Maltese Front and Strait of Sicily ocean pattern analysis
N80-10565

MELTS (CRYSTAL GROWTH)
Alloys obtained in a state of weightlessness
N80-10270

MEMORY
Modality effects in scanning nonverbal information: Evidence for multiple memory codes
[AD-A072297] N80-10796

MENTAL PERFORMANCE
An aptitude-strategy interaction in linear syllogistic reasoning
[AD-A068498] N80-10791
Modality effects in scanning nonverbal information: Evidence for multiple memory codes
[AD-A072297] N80-10796
Human vigilance investigation analysis of the pattern array test [further data analysis]
[UCRL-13891-3] N80-10798

MERCURY COMPOUNDS
Linked and mercury-bridged nido-carboranes. High yield synthesis of mu, mu prime- [CH3] 2C2B4H5)2Hg, conversion to 3,3prime-(CH3) 2C2B4H52, cleavage, and oxidative addition of benzene. Synthesis of mu,mu prime-(b5b4)2Hg
[AD-A070777] N80-10333

MERCURY TELLURIDES
Minority carrier lifetime and diffusion length in P-type mercury cadmium telluride
[AD-A071094] N80-10934

METAL COATINGS
Electrochemical copper coatings for surface finishing of hf resonators
[LA-TR-79-10] N80-10352

METAL CRYSTALS
Modulated structures in inorganic one-dimensional metals — tetracyanoplatinate and bisoxaleplatinate
[CONF-790341-7] N80-10353
Electron-dislocation interaction at low temperatures — metal crystals and superconductivity
[COO-2305-6] N80-10943

METAL FATIGUE
Quasi-static crack growth in metals at elevated temperature, a review
[AD-A072347] N80-10348
Ductility in bending of molybdenum alloys irradiated between 425 and 1000C
[CONF-790125-53] N80-10354

METAL HYDRIDES
Hydrogen storage as a hydride. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0772/8] N80-10402
Electronic specific heats in metal-hydrogen systems
[CONF-790301-11] N80-10954

METAL MATRIX COMPOSITES
Metal matrix composites, volume 2: A bibliography with abstracts
[NTIS/PS-79/0680/3] N80-10324
Metal matrix composites. Volume 3: A bibliography with abstracts
[NTIS/PS-79/0681/1] N80-10325
Contact stress analysis of ceramic-to-metal interfaces
[AD-A072073] N80-10522

METAL OXIDE SEMICONDUCTORS
Non-rectangular mos field effect devices — topology gatefield effect transistors are studied
N80-10429

METAL POWDER
The development of aluminum-aluminum oxide alloys by mechanical alloying
N80-10340

METAL SHEETS
Determination of constitutive equations for high strength Aluminum and Titanium alloys applicable to sheet metal formability
[AD-A072121] N80-10346

METAL SURFACES
An attempt to produce both thick and thinned flowing superfluid films. 1: A study of the feasibility of verifying Lifshitz's theory of Van der Waals force for a metallic surface. 2: The electrohydrodynamic instability of the super-thick helium film
N80-10932

METAL-GAS SYSTEMS
Hydrogen diffusion and trapping in bcc and fcc metals
[BNL-26132] N80-10336

METALS
The relationships of the process variables and material properties on clad-rolled metals
N80-10343
Electronic specific heats in metal-hydrogen systems
[CONF-790301-11] N80-10954

METEORITE CRATERS
Riachao Ring, Brazil: A possible meteorite crater discovered by the Apollo astronauts
N80-10952

METEORITIC DAMAGE
Volcanic landforms and astroblemes
N80-10351

METEOROLOGICAL CHARTS
The 19702A GSRS, missile number 987, round number B-11
[AD-A070549] N80-10726

METEOROLOGICAL PARAMETERS
Navigation and meteorological error equations for some aerodynamic parameters
[NASA-TM-80804] N80-10170
The 19304D GSRS missile number 1026, round number v-25
[AD-A071425] N80-10720
The 19702A GSRS, missile no. 301, round B-10
[AD-A070787] N80-10721
The 19035D GSRS, missile number 1020, round number V-21
[AD-A070559] N80-10722
The 19304D GSRS, missile number 1023, round number V-23
[AD-A070558] N80-10723
The 12823AT lance, missile number 3382, round number 327 ECL 8 March 1979
[AD-A070557] N80-10724
The 19702A GSRS, missile number N/A, round number B-6/B-7, 26 March 1979
[AD-A070556] N80-10725
The [FA] 19304 GSRS, missile number 1019, round number V-20
[AD-A070830] N80-10727
The 19702A GSRS, round numbers B-2 and B-3 21 February 1979
[AD-A070814] N80-10728
Meteorological data analysis in support of the ABRES Program
[AD-A070946] N80-10729
Spectral radiometric measurement and analysis program. Volume 2: Description of the data collection program
[AD-A072079] N80-10731
Lance missile no. 4381, round no. 330 ACL
[AD-A071335] N80-10733
Sensitivity study of CFAS and CFAR objective analysis techniques
[AD-A071452] N80-10734
Turbulence environment characterization
[AD-A072379] N80-10736
Aircraft measurements of micrometeorological parameters at Panama City, Florida, in 1978
[AD-A070956] N80-10737
The 12823A lance missile number 4724 round number 332 NCL
[AD-A072044] N80-10738
Meteorological data bases available for the United States Department of Energy Oak Ridge Reservation
[ORNL/TM-6398] N80-10739

METEOROLOGICAL SATELLITES
Analysis of statistical parameters from satellite digital data, July 1978 GOES-west, for use in diagnosing marine fog
[AD-A072145] N80-10735

METEOROLOGY
Geophysics, astronomy and space, no. 452
[DPRS-76123] N80-10269
Statistical analysis of TSP and meteorological data in EPA region 6
[PB-296828/6] N80-10698

METHANE
Methane recovery from coalbeds
[DOE/MC-08089-T1] N80-10387
Energy and economic assessment of anaerobic digesters and biofuels for rural waste management
[PB-296523/6] N80-10398

METHYL ALCOHOLS
Modeling of flame properties of methanol
[UCRL-82434] N80-10385
Research guidance studies to assess gasoline from coal by methanol-to-gasoline and nassl-type Fischer-Tropsch technologies
[FE-2447-13] N80-10388
Biomass-based alcohol fuels: The near-term potential for use with gasoline
[HCP/T4101-03] N80-10393

METROLOGY
The calibration of a roundness standard
[PB-297708/0] N80-10406

MEXICO
Volcanic landforms and astroblemes
N80-10351

MICROCHANNELS
Approximate calculation of the laminar boundary layer in micronozzles
N80-10076

MICROCOMPUTERS
Variable sample time algorithms for microcomputer control of distributed parameter systems
N80-10430
A tactical system emulator for a distributed microcomputer architecture
[AD-A072578] N80-10810
Project Aries: Users manual for Aries 2 and associated subsystems
[AD-A072471] N80-10818

MICROCRACKS
Quasi-static crack growth in metals at elevated temperature, a review
[AD-A072347] N80-10348
System for detecting substructure microfractures and method therefore
[NASA-CASE-NPO-14192-1] N80-10507

MICROORGANISMS
Amount of microorganisms discharged from the upper respiratory tract and integument of people confined in a sealed chamber
N80-10767

MICROPROCESSORS
A portable stand for assessing the dynamics of a working individual's functional state — based on a microprocessor
N80-10750
NPS-PASCAL: A pascal implementation for microprocessor-based computer systems
[AD-A071972] N80-10806
Application of a microprogrammed, bit slice microprocessor to the real time imaging tracker problem
[AD-A071638] N80-10807

MICROPROGRAMMING
Application of a microprogrammed, bit slice microprocessor to the real time imaging tracker problem
[AD-A071638] N80-10807

MICROSTRUCTURE
Fracture characteristics of structural steels, reference manual
[AD-A072054] N80-10349
Investigation of microtubular ceramic structures — fabricating heat exchangers using polyurethane foam and ceramic coatings
[AD-A072144] N80-10369
Ultrastructure of chlorella pyrenoidosa cells [strain g-11-1] following growth under conditions of a prolonged space flight
N80-11081

MICROWAVE AMPLIFIERS
A point design for a gyrotron traveling wave tube amplifier
N80-10246

MICROWAVE EQUIPMENT
Microwave heating: Applications and equipment. Citations from NTIS data base
[NTIS/PS-79/0631/6] N80-10673
Microwave heating: Industrial applications. Citations from the engineering data base
[NTIS/PS-79/0632/4] N80-10674

MICROWAVE INTERFEROMETERS
Demonstration of remote clock monitoring by VLBI, with three baseline closure
N88-10247
Frequency down-converters as applied to VLBI
N88-10251
The NOCC radio science subsystem: System performance validation for the DSN radio science and Very Long Baseline Interferometry (VLBI) systems
N88-10252
MICROWAVE RADIOMETERS
Semiconductor millimeter and centimeter wave radiometer for the study of the radiation of an underlying surface
[NASA-TM-75671] N88-10477
MICROWAVE TRANSMISSION
Analysis of S-band solid-state transmitters for the solar power satellite
[NASA-CR-160320] N88-10000
MICROWAVES
Application of microwave energy to post-calcination treatment of high-level nuclear wastes — pellet drying and glass vitrification
[ICP-1183] N88-10089
MILITARY HELICOPTERS
A flight investigation of performance and loads for a helicopter with NLR-1T main-rotor blade sections
[NASA-TM-88365] N88-10136
MILITARY OPERATIONS
Application of GPS to low cost tactical weapons
N88-10174
Training effectiveness of the CH-47 flight simulators
[AD-A072317] N88-10236
Simulator for air-to-air combat motion system investigation
[AD-A072612] N88-10237
MILLIMETER WAVES
Noise considerations in millimeter-wave spectrometers
[LBL-7294] N88-10493
MINERAL EXPLORATION
Regional geochemical exploration for mineral deposits in the appalachians of central and northwestern Virginia
N88-10534
MINES (EXCAVATIONS)
Charged membrane, low pressure ultrafiltration to treat acid mine drainage waters
[PB-297289/9] N88-10703
MINING
Computer software to calculate and map geologic parameters required in estimating coal production costs
[EPRI-EA-674] N88-10584
MINORITY CARRIERS
Minority carrier lifetime and diffusion length in P-type mercury cadmium telluride
[AD-A071694] N88-10934
MISSILE CONFIGURATIONS
Advanced missile technology. A review of technology improvement areas for cruise missiles — including missile design, missile configurations, and aerodynamic characteristics
[NASA-CR-3187] N88-10183
MISSILE DESIGN
Advanced missile technology. A review of technology improvement areas for cruise missiles — including missile design, missile configurations, and aerodynamic characteristics
[NASA-CR-3187] N88-10183
MISSILE LAUNCHERS
The 1970ZA GSRS, missile no. 301, round D-10
[AD-A070707] N88-10721
MISSILE TRAJECTORIES
Meteorological data analysis in support of the ABRES Program
[AD-A070946] N88-10729
MISSILES
The 1930D GSRS missile number 1026, round number v-25
[AD-A071425] N88-10720
MIST
Measurement of phase velocities in mist flows using stagnation probes
[NUREG-CR-0648] N88-10469
MIXERS
An experimental investigation of forced mixing of a turbulent boundary layer in an annular diffuser — turbulent mixing in annular flow mixers and vortex generators
N88-10896
MIXING
Mass transfer and liquid-liquid dispersion in agitated vessels — mass transfer coefficients and drop size in unstable liquid-liquid interfaces after mixing
N88-10449
MIXTURES
Biomass-based alcohol fuels: The near-term potential for use with gasoline
[BCP/T4101-03] N88-10593
MODAL RESPONSE
Development of an actively modelocked and Q-switched oscillator for laser fusion program at LLL
[UCRL-81365] N88-10490
MODULUS OF ELASTICITY
Scattering of acoustic waves by elastic and viscoelastic obstacles of arbitrary shape immersed in a fluid
[AD-A072274] N88-10861
MOLECULAR BEAMS
Photodissociation mass spectrometric studies of selected compounds in a molecular beam
[LA-7727-T] N88-10335
MOLECULAR ENERGY LEVELS
Measurements of anomalous dispersion of HF in absorption
[AD-A071044] N88-10331
MOLECULAR EXCITATION
The relationship between excitation intensity and photochromic glass kinetics
[PM-492] N88-10362
Chemiluminescence of diphenyl peroxide. Pulsed laser spectrophotometric detection of radical ion intermediates on the CIEEL path
[AD-A071131] N88-10486
MOLECULAR SPECTRA
Elements of the theory of molecular spectra — multiatomic molecules
[NASA-TM-75686] N88-10866
MOLECULAR SPECTROSCOPY
Measurements of anomalous dispersion of HF in absorption
[AD-A071044] N88-10331
MOLECULAR STRUCTURE
Energy transfer in anisotropic systems. A: Excitation migration in substitutionally disordered one-dimensional solids. B: The spectroscopy of molecules absorbed on metal surfaces
[LBL-8332] N88-10648
MOLECULES
Non-equilibrium processes in interstellar molecules
[NASA-TM-75685] N88-10901
MOLTEN SALTS
Molten salt pyrolysis of latex — for hydrocarbon fuel production
[NASA-CASE-NPO-14315-1] N88-10361
MOLYBDENUM
High temperature tungsten-rhenium thermocouples with molybdenum-rhenium sheaths
[TFBP-TR-285] N88-10482
Dependence of fracture toughness of molybdenum laser welds on dendritic spacing and in situ titanium additions
[SAND-79-0039C] N88-10501
MOLYBDENUM ALLOYS
Ductility in bending of molybdenum alloys irradiated between 425 and 1000C
[CONF-790125-53] N88-10354
MONOCHROMATIC RADIATION
Serrated apertures: Statistical diffraction theory and experiments
N88-10902
MORPHOLOGY
South American river morphology and hydrology
N88-10574
Ultrastructural changes in canine hepatocytes during continuous chronic exposure to low doses of gamma radiation
N88-10768
MOSSBAUER EFFECT
An experimental investigation of angular effects on the Mossbauer linebreadth and time domain analysis of Mossbauer line broadening
N88-10926
MOTION PERCEPTION
Experiments in sensing transient rotational acceleration cues on a flight simulator
[NASA-TP-1537] N88-10193
Evoked cortical potentials and information processing
[AD-A070789] N88-10794
MOTION SICKNESS
Current conceptions on the genesis of vestibulogyrative disorders in weightlessness
N88-10753
MOTION SIMULATORS
Manned engineering flight simulation validation, Part 1. Simulation requirements and simulator motion system performance
[AD-A071394] N88-10235
MOTOR VEHICLES
Modeling the impacts of transportation systems management on vehicle emissions, phase I
[PB-296908/7] N88-10697
MOUNTAINS
Photogeologic analysis of ASTP photographs of the Lake Torrens-Flinders Ranges-Lake Blanche area, South Australia — identification of folds, faults, and lineaments
N88-10550
MULTICHANNEL COMMUNICATION
Error control systems for multi-access communication channels — quality control error detection codes for multichannel communication
N88-10409
MULTIPHASE FLOW
Study of mass exchange between primary zone and secondary air jets in gas turbine engine combustion chambers
N88-10075
MULTIPLE ACCESS
Error control systems for multi-access communication channels — quality control error detection codes for multichannel communication
N88-10409
MULTIPROGRAMMING
Application of queueing models to multiprogrammed computer systems operating in a time-critical environment
[NASA-TM-80143] N88-10854
MUONS
Dimuon production in 15.5 GeV/c pion p interactions
N88-10864

N

N-TYPE SEMICONDUCTORS
Rectification at N-N GaAS: [Ga, Al]As heterojunctions
[AD-A071732] N88-10937
Rectification at nGaAs - n Ga.7Al.3As heterojunctions grown by LPE
[AD-A071733] N88-10938
NASA PROGRAMS
NASA overview
N88-10109
The requirements and feasibility of business planning in the office of space and terrestrial applications
[NASA-CR-162388] N88-10852
NSSDC data listing
[NASA-TM-80509] N88-10926
NASA authorization for fiscal year 1980. Part 4: Index
[GPO-51-334] N88-10964
NASA Tech Briefs Index, 1978 — bibliography
[NASA-SP-7021(20)] N88-10967
NASTRAN
Angular vibration of aircraft. Volume 1: Executive summary
[AD-A071895] N88-10197
Angular vibration of aircraft. Volume 2: Prediction methods for angular vibration
[AD-A071749] N88-10198
Effect of time dependent flight loads on JTPD-7 performance deterioration
[NASA-CR-159681] N88-10515
NATURAL GAS
National gas reserves estimates: A good federal program emerging, but problems and duplications persist
[PB-296628/2] N88-10679
Remote sensing of LNG spill vapor dispersion using Raman LIDAR
[UCRL-13984] N88-10689
NAVIGATION
Navigation and meteorological error equations for some aerodynamic parameters
[NASA-TM-80004] N88-10150
JTIDS expendable/low cost terminal development
N88-10187
NAVIGATION AIDS
Algorithms and logic for incorporating ILS NASA TCV B-737 airplane area navigation system
[NASA-TM-80147] N88-10152
Integration of GPS with inertial navigation systems
N88-10173
Integrated Tactical Navigation Systems (ITNS) — performance tests of navigation aids for rangefinding for air and surface navigation
N88-10182
JTIDS: The issue of frequency selection — low frequency assignment for pulse communication navigation aids
N88-10183
JTIDS signal structure
N88-10184
Command and control terminals — systems engineering of command and control terminals for pulse communication navigation aids
N88-10185
An/URQ-28 JTIDS class 2 tactical terminal — systems engineering of time division multiple access and TACAN signal processing for pulse communication navigation aids
N88-10186
JTIDS expendable/low cost terminal development
N88-10187
Integration developments
N88-10188
JTIDS II/DTDMA - command and control terminals
N88-10190
JTIDS II/DTDMA tactical terminal
N88-10191
Human factors in the design and evaluation of aviation maps
[AGARD-AG-225] N88-10536
NAVIGATION SATELLITES
The timation navigation satellites
N88-10157
Principle of operation of NAVSTAR and system characteristics
N88-10158

NAVSTAR SATELLITES
A time transfer unit for GPS
N80-10167
Civil applications of NAVSTAR GPS
N80-10175
NAVY
An overview of current Navy programs to develop thrust augmenting ejectors
N80-10110
NEAR INFRARED RADIATION
Near infrared photographic sky survey. 1: Catalog of red stellar objects
[NASA-CR-162306] N80-10978
NETWORK ANALYSIS
A theory and an algorithm for analog circuit fault diagnosis
N80-10426
NEUROGLIA
Levels and proportion of RNA and proteins in the system of the neuron: Vestibular nuclear neuroglia and cerebellum during hypokinesis
N80-10764
NEURONS
Levels and proportion of RNA and proteins in the system of the neuron: Vestibular nuclear neuroglia and cerebellum during hypokinesis
N80-10764
NEUTRINOS
Production and detection of new neutrinos
[ORO-3992-246] N80-10882
NEUTRON CROSS SECTIONS
Production of hydrogen, deuterium, and helium by 15-MeV neutrons
[COO-2719-5] N80-10877
NEUTRON DISTRIBUTION
One- and two-dimensional heating analyses of fusion-applied blankets
[BNL-NUREG-25615] N80-10922
NEUTRON IRRADIATION
Ductility in bending of molybdenum alloys irradiated between 425 and 1000C
[CONF-790125-53] N80-10354
Effects of stoichiometry and neutron irradiation in superconducting A-15 compounds
[BNL-25940] N80-10944
NEW ENGLAND [US]
Source and propagation effects of Rayleigh waves from central Asian earthquakes — and the geological structure of New England
[AD-A070241] N80-10714
NEW MEXICO
Safety and environmental implications DOE/Sandia Midtemperature Solar Systems Test Facility
[SAND-78-2292C] N80-10609
The 1970ZA GSRS, missile number N/A, round number B-6/B-7, 26 March 1979
[AD-A070556] N80-10725
The 1970ZA GSRS, missile number 007, round number B-11
[AD-A070549] N80-10726
The 1970ZA GSRS, round numbers B-2 and B-3 21 February 1979
[AD-A070814] N80-10728
NICKEL
Fischer-Tropsch synthesis over nickel catalysts — chemical reaction of nickel catalysts over hydrocarbons
N80-10326
Interaction of surface waves with thin nickel films
N80-10931
NICKEL CADMIUM BATTERIES
Nickel cadmium batteries. Volume 1: Citations from the NTIS data base
[NTIS/PS-79/0646/4] N80-10669
Nickel cadmium batteries. Volume 2: A bibliography with abstracts
[NTIS/PS-79/0647/2] N80-10670
NICKEL COMPOUNDS
Nickel boron hybrid clusters: Synthesis of polyhedral nickelaboranes and nickelacarboranes from small borane and carborane anion. Crystal structure of (eta5-C5H5)4Ni4B4H4
[AD-A070926] N80-10345
NICKEL OXIDES
Stresses in sputter deposited Nickel and Copper oxide thin films
[SAND-79-8045C] N80-10351
NICKEL STEELS
Fatigue crack propagation in high alloy and corrosion resistant [stainless] steel plate, bar and forgings
[ESDU-79003] N80-10341
NIGHT VISION
Use of the pupil to study the scotopic and chromatic mechanisms of vision in humans
N80-10777
NITRO COMPOUNDS
Fluorodinitro silicon compounds and high energy elastomeric polymers
[AD-A072599] N80-10367
NOISE (SOUND)
Communication network synchronization in the presence of noise
N80-10411
High intensity sound research, 1961-1978
[AD-A072550] N80-10860
Acoustic Fluctuation Workshop: Technical review, editorial summary, synopsis and papers, volume I
[AD-A072909] N80-10862
NOISE GENERATORS
The noise properties of thick film resistors
N80-10428
NOISE INTENSITY
The effect of the duration of jet aircraft flyover sounds on judged annoyance — noise predictions and noise measurements of jet aircrafts and human reactions to the noise intensity
[NASA-CR-159132] N80-10859
NOISE MEASUREMENT
Aero-acoustic tests of duct-burning turbofan exhaust nozzles
[NASA-CR-162254] N80-10204
The effect of the duration of jet aircraft flyover sounds on judged annoyance — noise predictions and noise measurements of jet aircrafts and human reactions to the noise intensity
[NASA-CR-159132] N80-10859
NOISE PREDICTION (AIRCRAFT)
The effect of the duration of jet aircraft flyover sounds on judged annoyance — noise predictions and noise measurements of jet aircrafts and human reactions to the noise intensity
[NASA-CR-159132] N80-10859
NOISE REDUCTION
Structural stiffening as an interior noise control technique for light twin-engine aircraft
N80-10192
Noise reduction
N80-10208
Communication network synchronization in the presence of noise
N80-10411
NOISE TEMPERATURE
S-band ultralow-noise traveling-wave maser — study of superhigh frequency traveling wave masers and its noise temperature
N80-10260
NOMENCLATURES
Lexicon of aircraft transparency terms
[AD-A071319] N80-10290
NONDESTRUCTIVE TESTS
Ultrasonic imaging as applied to non-destructive testing of rocket propellants
N80-10313
Dimensions/NBS. Volume 63, Number 3, March 1979 — standards for nondestructive tests
[PB-296733/9] N80-10405
Reliability of nondestructive inspections
[AD-A072097] N80-10503
Nondestructive ultrasonic testing and inspection. Volume 3: Citations from the engineering index data base
[NTIS/PS-79/0634/5] N80-10505
Nondestructive ultrasonic testing and inspection. Volume 4: Citations from the engineering index data base, April 1978 May 1979
[NTIS/PS-79/0637/3] N80-10506
A new method of electric measurement of crack length
[RAE-TRANS-2016] N80-10517
NONEQUILIBRIUM THERMODYNAMICS
Non-equilibrium processes in interstellar molecules
[NASA-TM-75685] N80-10981
NONLINEAR EQUATIONS
Most rational linearization of nonlinear unsteady heat conduction problems
N80-10012
Method of time series modelling, parameter and state estimation of nonlinear systems — for real time Naval combat weapon systems
N80-10853
NONLINEAR SYSTEMS
Some problems of nonlinear waves in solid propellant rocket motors
N80-10301
Nonlinear spectroscopy
[AD-A071282] N80-10334
An incremental form of the single-integral nonlinear viscoelastic theory for elastic-plastic-creep finite element analysis
[AD-A072151] N80-10523
Method of time series modelling, parameter and state estimation of nonlinear systems — for real time Naval combat weapon systems
N80-10853
High intensity sound research, 1961-1978
[AD-A072550] N80-10860
NONLINEARITY
Modeling approach suitable for energy system
[CONF-790459-4] N80-10632
NONPARAMETRIC STATISTICS
On rates of convergence in the L2 norm of nonparametric probability density estimates
[AD-A072134] N80-10848
NONUNIFORMITY
Nonstationarity of heat transfer in axial turbine blading during engine startup
N80-10689
NORMAL DENSITY FUNCTIONS
Cluster analysis based on density estimates and its application to landsat imagery
N80-10533
NOSES (FOREBODIES)
Two-dimensional flow past convex and concave corners at transonic speed and two-dimensional flow around a parabolic nose at subsonic and transonic speeds
N80-10092
NOTCH STRENGTH
Constant and variable loading fatigue strength of black-heart malleable cast iron regarding metallurgical characteristics
[ICAF-1009] N80-10511
NOZZLE DESIGN
Systematization of simple detail parts of regulable nozzle of gas turbine engine
N80-10071
Effect of several airframe/nozzle modifications on the drag of a variable-sweep bomber configuration — conducted in Langley 16 foot transonic tunnel
[NASA-TM-80129] N80-10106
An overview of current Navy programs to develop thrust augmenting ejectors
N80-10110
Computer aided design study of hypermixing nozzles
N80-10116
Nonsteady-flow thrust augmenting ejectors
N80-10117
Spray nozzle designs for agricultural aviation applications — relation of drop size to spray characteristics and nozzle efficiency
[NASA-CR-159702] N80-10460
NOZZLE EFFICIENCY
Spray nozzle designs for agricultural aviation applications — relation of drop size to spray characteristics and nozzle efficiency
[NASA-CR-159702] N80-10460
NOZZLE FLOW
Application of the gas flow dimensionless characteristics method for experimental study of sonic nozzles
N80-10002
Study of self-oscillatory liquid film flow regime in coaxial air stream
N80-10004
Correlation of experimental data on two-phase flow heat transfer in convergent part of a nozzle
N80-10021
Approximate calculation of the laminar boundary layer in micronozzles
N80-10076
Workshop on Thrust Augmenting Ejectors
[NASA-CP-2093] N80-10107
Numerical prediction of 3-D ejector flows
N80-10111
NOZZLE GEOMETRY
Systematization of simple detail parts of regulable nozzle of gas turbine engine
N80-10071
Coannular supersonic ejector nozzles
N80-10128
A simple method to estimate the influence of a small variation in the throat area on the performance of solid rockets
N80-10287
NUCLEAR EXPLOSION EFFECT
Fiber optic utilization at the Nevada Test Site — radiation effects on underground cables for analog data transmission
[LA-7829-MS] N80-10912
NUCLEAR EXPLOSIONS
Airblast vulnerability envelopes for supersonic aerospace vehicles
[AD-A072247] N80-10201
NUCLEAR FISSION
Role of deep inelastic processes in nuclear physics: Experimental and theoretical aspects of deep inelastic reactions
[LBL-9936] N80-10895
NUCLEAR FUEL REPROCESSING
Improvements in remote equipment torquing and fastening
[CONF-781105-64] N80-10499
NUCLEAR FUSION
Development of an actively modelocked and Q-switched oscillator for laser fusion program at LLL
[UCRL-81365] N80-10490
Telescoping beams for heavy ion fusion
[CONF-790327-100] N80-10917
Computer simulation of kinetic properties of plasma — magnetic fusion energy
[COO-2280-10] N80-10920
NUCLEAR INTERACTIONS
Experiments on the nuclear interactions of pions
[ORO-4043-38] N80-10881
NUCLEAR MAGNETIC RESONANCE
Analysis and computerized fitting of the lineshape of the NMR powder pattern
[IS-4516] N80-10874
NUCLEAR PHYSICS
Role of deep inelastic processes in nuclear physics: Experimental and theoretical aspects of deep inelastic reactions
[LBL-9936] N80-10895
NUCLEAR REACTIONS
Modified method of perturbed stationary states I
[SAND-78-0235] N80-10893

NUCLEAR REACTORS
Computer model for ductile fracture — nuclear reactor pressure vessels
[UCID-18870] N80-10326

NUCLEAR SCATTERING
Intermediate energy, inelastic, and charge exchange nucleon-nucleon scattering
N80-10879

NUCLEAR STRUCTURE
Study of structure of light nuclei with neutrons
[COO-3490-9] N80-10872
Intermediate energy, inelastic, and charge exchange nucleon-nucleon scattering
N80-10879

NUCLEATION
A perspective of a workshop on stability of thin film solar cells and materials
[PB-297396/4] N80-10676

NUCLEI (NUCLEAR PHYSICS)
Study of structure of light nuclei with neutrons
[COO-3490-9] N80-10872

NUCLEON-NUCLEON SCATTERING
Multipion production in nuclear collisions — distribution functions and particle production in particle collisions and nucleon-nucleon scattering
[LBL-8738] N80-10894

NUCLEOTIDES
Effect of space flight conditions on deoxyribonucleoprotein and nucleic acid content of rat tissues
N80-10760

NUMERICAL ANALYSIS
Flow around axisymmetric bodies: The direct and inverse problems
N80-10100
Analyses of plates constructed of fiber-reinforced biaxolsin composite materials
[AD-A071377] N80-10320
Electromagnetic scattering by a two-dimensional inhomogeneity due to an oscillating magnetic dipole
[LBL-8275] N80-10424
Heat transfer into the infinite region external to a cylinder
[SAND-78-1942] N80-10486

NUMERICAL CONTROL
Variable sample time algorithms for microcomputer control of distributed parameter systems
N80-10450
Continuous simulation of queueing networks with transient and time varying conditions
N80-10833

NUMERICAL FLOW VISUALIZATION
Numerical prediction of 3-D ejector flows
N80-10111
Numerical simulation of dual-media thermal energy storage systems — fluid and solid temperature distributions
[SAND-78-2282C] N80-10442

NUMERICAL INTEGRATION
Lyapunov stability and its application to systems of ordinary differential equations
[NASA-TM-80806] N80-10835

NUTRITION
Dietary supplements used to prevent some changes in the human body in the presence of nervous and emotional stress
N80-10758

NUTRITIONAL REQUIREMENTS
Bush nuts [Cyperus esculentus] as a source of vegetable oil in a closed life support system
N80-10769

NUTS [FRUITS]
Bush nuts [Cyperus esculentus] as a source of vegetable oil in a closed life support system
N80-10769

NYLON [TRADEMARK]
Accelerated aging of parachute materials
[SAND-79-0894C] N80-10144

O

OCEAN BOTTOM
Minisubs for deep-sea exploration
N80-10999

OCEAN CURRENTS
Antipodal seas — astronaut observation of ocean features
N80-10564
Maltese Front and Strait of Sicily ocean pattern analysis
N80-10565
Circulation and hydrography near Kodiak Island, September to November 1977
[PB-297421/0] N80-10743

OCEAN SURFACE
Determining photograph locations over oceans
N80-10561
Visual observations over oceans
N80-10563
Observations of internal-wave surface signatures in ASTP photographs
N80-10570

OCEAN THERMAL ENERGY CONVERSION
State-of-the-art survey of joinability of materials for OTEC heat exchangers
[ORNL/TM-6284] N80-10647

OCEANOGRAPHIC PARAMETERS
Antipodal seas — astronaut observation of ocean features
N80-10564

OCEANOGRAPHY
Geophysics, astronomy and space, no. 452
[JPRS-74125] N80-10269
Interpreting ASTP photographs of the ocean and locating the area photographed, case study of the Gulf of Mexico
N80-10562
Hydrographic observations in the Georgia Bight, July 1977
[PB-297135/6] N80-10742

OCEANS
Ocean color observations — by astronauts
N80-10566

OFFSHORE ENERGY SOURCES
Offshore pipeline corridors and landfalls in coastal Virginia, volumes 1 and 2 and appendices
[PB-297439/2] N80-10708

OHMIC DISSIPATION
Experimental joule-heated ceramic melter for converting radioactive waste to glass
[DP-MS-78-59] N80-10888

OIL EXPLORATION
Borehole geological assessment
[NASA-CASE-NPO-14231-1] N80-10709

OIL POLLUTION
Analysis of method of polarization surveying of water surface oil pollution
[NASA-TM-75708] N80-10686

OIL SLICKS
Analysis of method of polarization surveying of water surface oil pollution
[NASA-TM-75708] N80-10686

OPERATING SYSTEMS [COMPUTERS]
Optimization of computer operating systems
[AD-A071463] N80-10834

OPERATOR PERFORMANCE
Remote operator performance comparing mono and stereo TV displays: The effects of visibility, learning and task factors
[AD-A068201] N80-10793

OPERATORS [MATHEMATICS]
Method of conjugate gradients for optimal control problems with state variable constraints
[AD-A072258] N80-10227

OPTICAL COMMUNICATION
The R sub 0 parameter for optical communication using photon counting
N80-10249
Use of predistortion to reduce intermodulation distortion in optical fiber communication sources
[AD-A072637] N80-10910

OPTICAL EQUIPMENT
Heat pipe thermal control of slender optics probes
[LA-UR-79-3149] N80-10467
Fiber optics transmitter integrated circuit development
[AD-A071437] N80-10989

OPTICAL FILTERS
X-ray tomography by optical reconstruction from projections
N80-10903

OPTICAL MEASUREMENT
Self-study manual on optical radiation measurements Part 1: Concepts. Chapters 7: The relative spectral responsivity and slit-scattering function of a spectroradiometer. Chapter 8: Deconvolution. Chapter 9: Physically defining measurement-beam geometry by using opaque barriers.
[PB-296047/4] N80-10740
An experimental study of optical phase fluctuations in a random refractive field — optical measurement of phase deviation in optical paths during refraction
N80-10905
Refraction corrections for surveying
[NASA-TM-80803] N80-10907

OPTICAL PATHS
An experimental study of optical phase fluctuations in a random refractive field — optical measurement of phase deviation in optical paths during refraction
N80-10905

OPTICAL PROPERTIES
Nonlinear spectroscopy
[AD-A071282] N80-10334
Feedback systems for image acquisition and processing — imaging techniques and optical properties of feedback for image resolution
N80-10906

OPTICAL PUMPING
Mid-infrared optically pumped lasers
[LA-7331-MS] N80-10491

OPTICAL RADAR
Quasi-three-dimensional display of infrared radar images using range/intensity color mapping
[AD-A070671] N80-10417
Remote sensing of LNG spill vapor dispersion using Raman LIDAR
[UCRL-13984] N80-10689

OPTICAL RESONATORS
Second-order perturbation theory for Fabry-Perot resonators — study of phase shifts caused by perturbations of optical resonators
N80-10904

OPTICAL TRACKING
Application of a microprogrammed, bit slice microprocessor to the real time imaging tracker problem
[AD-A071638] N80-10807

OPTIMAL CONTROL
Optimal control of flight vehicle with elastic elements
N80-10837
Multivariable digital control systems
[AD-A071662] N80-10226
Method of conjugate gradients for optimal control problems with state variable constraints
[AD-A072258] N80-10227
Minimum cost transmitter-receiver antenna pairs — antenna design for the satellite solar power station using optimal control theory
[RM-690] N80-10414
Optimal control of distributed parameter systems for solar thermal applications
N80-10593
Optimal control studies of a solar heating system
[LA-UR-78-2536] N80-10646

OPTIMIZATION
On minimizing integral quadratic estimates
N80-10051
Wind-tunnel investigation of the validity of a sonic-boom-minimization concept — Langley Unitary Plan Wind Tunnel tests for supersonic transport design
[NASA-TP-1421] N80-10182
Use of wagner functions in airfoil design optimization
[AD-A072634] N80-10139
On the optimal selection of satellites in GPS
N80-10178
A study to develop optimization algorithms for aircraft wing structures
[AD-A072648] N80-10196
Advanced simulator for pilot training [ASPT]: G-seat optimization
[AD-A068475] N80-10233
Set covering algorithms using cutting planes, heuristics, and subgradient optimization: A computational study
[AD-A072658] N80-10820
Optimization of computer operating systems
[AD-A071463] N80-10834

ORBITAL MANEUVERS
Passive propellant system
[NASA-CASE-MFS-23642-1] N80-10278

ORGANIC COMPOUNDS
Investigation into the chemistry of the UV-ozone purification process
[PB-296485/6] N80-10337
The development of Amiguard, a clear, water displacing, corrosion preventive compound
[AD-A071617] N80-10347
Chemiluminescence of diphenyl peroxide. Pulsed laser spectrophotometric detection of radical ion intermediates on the CIEEL path
[AD-A071151] N80-10486
Dichromate oxidability as a criterion of quantitative levels of organic impurities in reclaimed water
N80-10766

ORGANIC SILICON COMPOUNDS
Fluorodinitro silicon compounds and high energy elastomeric polymers
[AD-A072559] N80-10347

ORGANIC WASTES [FUEL CONVERSION]
Waste utilization as an energy source. Citations from the International Aerospace Abstracts Data Base
[NTIS/PS-79/0765/2] N80-10647

ORGANOMETALLIC COMPOUNDS
Nickel boron hybrid clusters: Synthesis of polyhedral nickelaboranes and nickelcarboranes from small borane and carborane anion. Crystal structure of [eta5-C5H5]2Ni4B4H4
[AD-A070926] N80-10345

OSCILLATING FLOW
Study of self-oscillatory liquid film flow regime in coaxial air stream
N80-10004
On the influence of liquid oscillations in fuel line on the head of a pump operating in regimes with reverse flow
N80-10010

OSCILLATORS
Development of an actively modelocked and Q-switched oscillator for laser fusion program at LLL
[UCRL-81365] N80-10490

OVENS
Microwave heating: Applications and equipment. Citations from NTIS data base
[NTIS/PS-79/0631/6] N80-10673

OVERPRESSURE
Wind-tunnel investigation of the validity of a sonic-boom-minimization concept — Langley Unitary Plan Wind Tunnel tests for supersonic transport design
[NASA-TP-1421] N80-10182

OXALATES
Modulated structures in inorganic one-dimensional metals I -- tetracyanoplatinate and bisoxalatoiridate
[CONF-790341-7] N80-10033
OXIDATION
Multiple steady states of the oxidation of carbon monoxide on a supported platinum catalyst
N80-10327
Compound oxidized styrylphosphine — flame resistant vinyl polymers
[NASA-CASE-MSC-14903-2] N80-10338
Acid digestion of combustible waste
[HEDL-TME-79-77] N80-10614
Dichromate oxidizability as a criterion of quantitative levels of organic impurities in reclaimed water
N80-10766
OXIDATION-REDUCTION REACTIONS
Linked and mercury-bridged nido-carboranes. High yield synthesis of mu, mu prime- [CH3)] 2C2B4H52Hg, conversion to 5,5prime-(CH3) 2C2B4H52, cleavage, and oxidative addition of benzene. Synthesis of mu,mu prime-(h5h5)2Hg
[AD-A070777] N80-10333
OXYGEN
Characteristics of afterburning bypass turbojet engine with oxygen injection into the afterburner chamber — study of fuel injection into thrust chambers for thrust augmentation
N80-10829
Investigation of alveolararterial difference for oxygen and carbon dioxide when breathing high-density gas mixtures
N80-10774
OXYGEN BREATHING
Some hemodynamic parameters during respiration of oxygen under excessive pressure
N80-10765
OZONE
Investigation into the chemistry of the UV-ozone purification process
[PB-296485/6] N80-10337
Experimental determination and modeling of dry deposition for ozone
N80-10684
Example control strategy for ozone. Volume 2: Case study of the San Francisco Bay region, 1976-1978
[PB-297800/5] N80-10706

P

P-TYPE SEMICONDUCTORS
Minority carrier lifetime and diffusion length in P-type mercury cadmium telluride
[AD-A071094] N80-10934
PACIFIC OCEAN
Typhoon report, 1978
[AD-A070904] N80-10732
PAIR PRODUCTION
Dimuon production in 15.5 GeV/c pion p interactions
N80-10864
PANELS
An efficient user-oriented method for calculating compressible flow in an about three-dimensional inlets — panel method
[NASA-CR-159578] N80-10134
PARABOLOID MIRRORS
Temperature deformations of the mirror of a radio telescope antenna
[NASA-TM-75635] N80-10908
PARACHUTE FABRICS
Accelerated aging of parachute materials
[SAND-79-0894C] N80-10144
PARACHUTES
Observations on parachute scale factors for modeling parachute deployment and steady state performance
[AD-A070571] N80-10138
Accelerated aging of parachute materials
[SAND-79-0894C] N80-10144
PARAFFINS
Models for the migration of paraffinic additives in polyethylene
[PB-297671/0] N80-10372
PARALLEL COMPUTERS
Introduction to VECTRAN and its use in scientific applications programming
[LA-7491-C] N80-10830
PARAMAGNETISM
Magneto-optical studies of paramagnetic systems to determine their potential for use as continously tunable coherent far-infrared sources
N80-10899
PARAMETERIZATION
The inverse problem of control system guaranteed sensitivity
N80-10832
Maximum likelihood identification of linear discrete stochastic systems — estimating and parameter identification in stochastic processes
[AD-A072147] N80-10229
PARTIAL DIFFERENTIAL EQUATIONS
Method of lines approach to the numerical solution of conservation laws — time dependent solutions of hyperbolic partial differential equations
[LA-UR-79-837] N80-10841
Modeling for moving boundary problems
[CONF-790345] N80-10843
PARTICLE ACCELERATION
Telescoping beams for heavy ion fusion
[CONF-790327-100] N80-10917
Ion acceleration at the earth's bow shock: A review of observations in the upstream region
[LA-UR-79-309] N80-10984
PARTICLE ACCELERATORS
Development and testing of a three-stage double tandem accelerator-decelerator system for low energy, highly stripped ions
[COO-4257-3] N80-10878
PARTICLE BEAMS
Impact of storage rings on elementary particle physics
[LBL-8908] N80-10869
Production and detection of new neutrinos
[ORO-3992-346] N80-10882
PARTICLE COLLISIONS
Multipion production in nuclear collisions — distribution functions and particle production in particle collisions and nucleon-nucleon scattering
[LBL-8738] N80-10894
PARTICLE EMISSION
Studies of chemical and mechanical surface phenomena by particle emission techniques
N80-10933
PARTICLE INTERACTIONS
Heavy lepton phenomenology
[SLAC-PUB-2219] N80-10883
New particles, theoretical
[LBL-7977] N80-10887
PARTICLE MOTION
Flow on magnetizable particles in turbulent air streams
[NASA-CR-162418] N80-10461
Alpha transport and blistering in tokamaks
[SAND-78-8684] N80-10916
Analytic coherent states for generalized potentials -- motion of a classical particle
[LA-UR-79-218] N80-10951
PARTICLE PRODUCTION
Production and detection of new neutrinos
[ORO-3992-346] N80-10882
Multipion production in nuclear collisions — distribution functions and particle production in particle collisions and nucleon-nucleon scattering
[LBL-8738] N80-10894
PARTICLE SIZE DISTRIBUTION
Study of size distribution of oil drops formed in GYE oil
N80-10888
Erosive and transient burning effects on performance prediction accuracy of tactical rockets
N80-10295
Aluminum combustion under rocket motor conditions
N80-10294
Morphology of rubber modified epoxy encapsulants
[SAND-79-0158C] N80-10870
PARTICLE TELESCOPES
Telescoping beams for heavy ion fusion
[CONF-790327-100] N80-10917
PARTICLES
Statistical analysis of TSP and meteorological data in EPA region 6
[PB-296838/6] N80-10698
PATTERSON MAP
Structure solution methods for superstructures
[CONF-790342-1] N80-10945
PAVEMENTS
Longitudinal joint systems in slip-formed rigid pavements. Volume 1: Literature survey and field inspection
[AD-A066320] N80-10230
Improvement of wear-resistance properties of natural aggregates by materials impregnation
[BNL-25396] N80-10323
Transient aspect of hydroplaning: Hydroplaning phenomenon during sudden changes in the fluid layer on a pavement — effect of fluid films on tires on a highway
N80-10448
PDP 11 COMPUTER
Video control center and cockpit simulator
[AD-A071313] N80-10234
PERFORATED SHELLS
Liquid ejector with perforated nozzle
N80-10072
PERFORMANCE
Dynamic characteristics of flight simulator motion systems
[AGARD-AR-144] N80-10238
PERFORMANCE PREDICTION
Solid propellant specific impulse prediction
N80-10286
A simple method to estimate the influence of a small variation in the throat area on the performance of solid rockets
N80-10287
Effect of time dependent flight loads on JT9D-7 performance deterioration
[NASA-CR-159681] N80-10515
PERFORMANCE TESTS
On the influence of short shroud platforms on turbine stage operation — performance tests for shrouded rotor blades on gas turbine engines
N80-10683
A flight investigation of performance and loads for a helicopter with NLR-1T main-rotor blade sections
[NASA-TM-80165] N80-10136
Integrated Tactical Navigation Systems (ITNS) — performance tests of navigation aids for rangefinding for air and surface navigation
N80-10182
Radio frequency performance of DSS 14 64-m antenna at X-band using a dual hybrid mode feed
N80-10238
A performance evaluation of mini-laser cartridge devices
[AD-A072505] N80-10488
PERIODIC VARIATIONS
Study of periodic motions of a satellite with a magnetic damper
[NASA-TM-75667] N80-10273
PERIODICALS
Dimensions/NBS, volume 63, no. 6, June 1979
[PB-297836/9] N80-10975
PERIPHERAL CIRCULATION
Some hemodynamic parameters during respiration of oxygen under excessive pressure
N80-10765
PERMANGANATES
Dichromate oxidizability as a criterion of quantitative levels of organic impurities in reclaimed water
N80-10766
PERMEABILITY
System for detecting substructure microfractures and method therefore
[NASA-CASE-NPO-14192-1] N80-10307
PEROXIDES
Chemiluminescence of diphenyl peroxide. Pulsed laser spectrophotometric detection of radical ion intermediates on the CIEEL path
[AD-A071151] N80-10486
PERSONNEL SELECTION
The development of the ATC selection battery: A new procedure to make maximum use of available information when correcting correlations for restriction in range due to selection
[AD-A066132] N80-10788
PERTURBATION THEORY
Modified method of perturbed stationary states I
[SAND-78-0235] N80-10893
Second-order perturbation theory for Fabry-Perot resonators — study of phase shifts caused by perturbations of optical resonators
N80-10904
PHARMACOLOGY
Feasibility of commercial space manufacturing, production of pharmaceuticals. Volume 1: Executive summary
[NASA-CR-161324] N80-10266
Feasibility of commercial space manufacturing, production of pharmaceuticals. Volume 2: Technical analysis
[NASA-CR-161325] N80-10267
Feasibility of commercial space manufacturing, production of pharmaceuticals. Volume 3: Product data
[NASA-CR-161326] N80-10268
USSR Report: Biomedical and Behavioral Sciences, no. 122 — emphasizing pharmacology in space flight, psychometric test equipment, and air filters
[JPRS-74365] N80-10748
Problems of pharmacology in space medicine
N80-10749
PHASE DEMODULATORS
Digital PSK to BiO-L demodulator for 2 sup nx[bit rate] carrier
[NASA-TM-80159] N80-10433
PHASE DEVIATION
An experimental study of optical phase fluctuations in a random refractive field — optical measurement of phase deviation in optical paths during refraction
N80-10905
PHASE LOCK DEMODULATORS
Digital PSK to BiO-L demodulator for 2 sup nx[bit rate] carrier
[NASA-TM-80159] N80-10433
PHASE SHIFT
Second-order perturbation theory for Fabry-Perot resonators — study of phase shifts caused by perturbations of optical resonators
N80-10904
PHASE SHIFT KEYING
Digital PSK to BiO-L demodulator for 2 sup nx[bit rate] carrier
[NASA-TM-80159] N80-10433

PHASE TRANSFORMATIONS
Self-similar solutions in the destruction and melting problem with account for abrupt density change — heat transfer problems for composite thermoprotective coatings
N80-10041
Investigation of the T sub 1 [T sub g] relaxation of homopolymers and block copolymers of styrene by torsional braid analysis
[AD-A072075] N80-10343
PHENANTHRENE
Chemiluminescence of diphenyl peroxide. Pulsed laser spectrophotometric detection of radical ion intermediates on the CIEEL path
[AD-A071151] N80-10406
PHENOLIC RESINS
Predicting the behavior of phenolic ablative materials
N80-10310
PHENOLS
Predicting the behavior of phenolic ablative materials
N80-10310
PHONONS
Theory of phonon echoes in insulators — time functions of sound waves
N80-10858
PHOSPHINES
Compound oxidized styrylphosphine — flame resistant vinyl polymers
[NASA-CASE-MSC-14980-2] N80-10358
PHOSPHORIC ACID
Technology development for phosphoric acid fuel cell powerplant, phase 2
[NASA-CR-159705] N80-10603
PHOSPHORUS POLYMERS
Flammability and thermal stability of polyphosphazenes copolymers, part 1
[AD-A072114] N80-10366
PHOTOCHEMICAL REACTIONS
Investigation into the chemistry of the UV-ozone purification process
[PB-296485/6] N80-10337
PHOTOCHROMISM
The relationship between excitation intensity and photochromic glass kinetics
[PB-692] N80-10362
PHOTODECOMPOSITION
Studies on the photodegradation of poly [methyl methacrylate]
[PB-297793/2] N80-10371
PHOTOELECTRICITY
Study of the optimum charge-transfer image sensor — photoelectric radiation measuring instruments with bucket brigade devices for imaging techniques
N80-10431
PHOTOGEOLOGY
Color of desert surfaces in the Arabian peninsula
N80-10558
Detection of a probable ancestral delta of the Nile River
N80-10571
PHOTOGRAMMETRY
Photogrammetric analysis of ASTP earth observations experiment data
N80-10581
PHOTOGRAPHIC FILM
Film selection for the earth observations and photography experiment
N80-10578
Film exposure calculations
N80-10579
ASTP photographic film processing and sensitometric summary
N80-10580
PHOTOGRAPHIC MEASUREMENT
Photographic combustion characterization of LOX/hydrocarbon type propellants
[NASA-CR-160318] N80-10378
PHOTOGRAPHIC PROCESSING
Film exposure calculations
N80-10579
ASTP photographic film processing and sensitometric summary
N80-10580
PHOTOINTERPRETATION
Interpreting ASTP photographs of the ocean and locating the area photographed, case study of the Gulf of Mexico
N80-10562
PHOTOIONIZATION
Photoionization mass spectrometric studies of selected compounds in a molecular beam
[LA-7727-T] N80-10335
PHOTOLYSIS
Hydrogen production. Citations from the International aerospace abstracts data base
[NTIS/PS-79/0773/6] N80-10481
PHOTONS
The R sub 0 parameter for optical communication using photon counting
N80-10249
Multiple photon process in SF6
N80-10485
PHOTOVOLTAIC CELLS
Analytical evaluation of a solar thermophotovoltaic [TPV] converter
[SAND-79-0506/C] N80-10638
Flywheel energy storage and conversion system for solar photovoltaic applications
[COO-4094-31] N80-10639
PHYSICAL EXERCISE
Effect of a rapid 4 percent carboxyhemoglobin saturation increase on maximal treadmill exercise
[PB-296627/3] N80-10786
PHYSICAL PROPERTIES
Physical properties data compilations relevant to energy storage, 2. Molten salts: Data on single and multi-component salt systems
[NSRDS-NBS-61-PT-2] N80-10643
PHYSIOCHEMISTRY
Pulmonary adaptation to high altitude
[AD-A068317] N80-10784
PHYSIOLOGICAL EFFECTS
Effect of space flight conditions on deoxyribonucleoprotein and nucleic acid content of rat tissues
N80-10760
The combined effect of carbon monoxide and hypokinesia
N80-10763
Pulmonary adaptation to high altitude
[AD-A068317] N80-10784
PILOT PERFORMANCE
Pilot performance during simulated approaches and landings made with various computer-generated visual glidepath indicators
[AD-A066220] N80-10151
Age-related distinctions of changes in psychophysiological functions of pilots in the civil aviation under the influence of vibration and noise
N80-10757
PILOT PLANTS
The 10MW[e] solar thermal central receiver pilot plant: Heliostat foundation and interface structure investigation
[SAND-78-8180] N80-10612
PILOT TRAINING
Advanced simulator for pilot training [ASPT]: G-seat optimization
[AD-A068475] N80-10233
Psychoprophylaxis of fatigue and functional cardiovascular diseases in pilots by means of self-conditioning
N80-10771
PIONEER PROJECT
Pioneer Saturn encounter — Pioneer 11 space probe
[NASA-TM-80007] N80-10239
PIONEER 11 SPACE PROBE
Pioneer Saturn encounter — Pioneer 11 space probe
[NASA-TM-80007] N80-10239
Pioneer 11 saturn encounter support
N80-10343
PIONS
Experiments on the nuclear interactions of pions
[ORO-4043-38] N80-10881
Multipion production in nuclear collisions — distribution functions and particle production in particle collisions and nucleon-nucleon scattering
[LBL-8758] N80-10894
PIPE FLOW
Experimental study of turbulence energy balance components in the section of a retarded turbulent boundary layer
N80-10019
Unsteady laminar-flow separation in tubes. 2: The effect of variations in the frequency and amplitude of flow oscillations
[PB-296968/1] N80-10473
PIPELINES
Offshore pipeline corridors and landfalls in coastal Virginia, volumes I and 2 and appendices
[PB-297459/2] N80-10708
PIPELINING [COMPUTERS]
Issues in the digital implementation of control compensators
[NASA-CR-162416] N80-10814
PIPES [TUBES]
Investigation of microtubular ceramic structures — fabricating heat exchangers using polyurethane foam and ceramic coatings
[AD-A072144] N80-10369
Coincidence of higher-order modes: A mechanism of the excitation of cylindrical shell vibrations via internal sound
N80-10510
Optimal insulation of pipes and tanks for solar heating systems
[ALO-5319-2] N80-10660
PISTONS
Calculation of working process in slow-compression piston-type aerodynamic tube
N80-10062
PITCH [INCLINATION]
Simulator for air-to-air combat motion system investigation
[AD-A072612] N80-10237
PLANETARY MAGNETIC FIELDS
Saturn's magnetosphere, rings, and inner satellites
[U-OF-IOWA-79-44] N80-10987
PLANTING
Design of a pilot silvicultural biomass farm at the Savannah River Plant
[HCP/T4101-01] N80-10394
PLANTS [BOTANY]
A low velocity water tunnel for biological research
N80-10271
PLASMA CONDUCTIVITY
Electron transfer in a superdense nondegenerate plasma
[UCRL-TRANS-11473] N80-10924
PLASMA DYNAMICS
Computer simulation of kinetic properties of plasma — magnetic fusion energy
[COO-2200-18] N80-10920
PLASMA PHYSICS
Numerical experiments on the theta pinch
[NASA-TM-75494] N80-10915
PLASMA TEMPERATURE
Establishment of the spectra of kinetic turbulence
[NASA-TM-75666] N80-10914
PLASMA TURBULENCE
Establishment of the spectra of kinetic turbulence
[NASA-TM-75666] N80-10914
PLASMA-ELECTROMAGNETIC INTERACTION
Numerical modeling of stimulation of induced magnetosphere during interaction of solar wind with the ionosphere of Venus
[NASA-TM-75921] N80-10990
PLASMA-PARTICLE INTERACTIONS
Proposal for the theoretical investigation of light-ion beam propagation through a residual plasma environment — for inertial confinement fusion reactors
[LA-7390-P] N80-10911
Computer simulation of kinetic properties of plasma — magnetic fusion energy
[COO-2200-18] N80-10920
PLASMAS [PHYSICS]
Magnetopause layer and plasma boundary layer of the magnetosphere
[LA-UR-78-2992] N80-10715
Electron transfer in a superdense nondegenerate plasma
[UCRL-TRANS-11473] N80-10924
PLASMONS
Establishment of the spectra of kinetic turbulence
[NASA-TM-75666] N80-10914
PLASTIC DEFORMATION
An investigation into the combined isotropic-kinematic workhardening rule
[AD-A072152] N80-10524
PLASTICIZERS
Fluorodinitro silicon compounds and high energy elastomeric polymers
[AD-A072559] N80-10367
PLATE THEORY
Analyses of plates constructed of fiber-reinforced biaxodulus composite materials
[AD-A071377] N80-10320
Finite-element analysis of laminated composite-material plates
[AD-A071390] N80-10321
Mantle fault zone and the opening of the Red Sea
N80-10541
PLATES [STRUCTURAL MEMBERS]
Recent research in composite and sandwich plate dynamics
[AD-A072277] N80-10322
PLATING
Electrical measurement of plating thickness
[BDX-613-1942-REV] N80-10442
PLATINUM
Multiple steady states of the oxidation of carbon monoxide on a supported platinum catalyst
N80-10327
PLATINUM COMPOUNDS
Modulated structures in inorganic one-dimensional metals — tetracyanoplatinate and bioxalatoplatinate
[CONF-790341-7] N80-10333
PLUTONIUM OXIDES
General-purpose heat source project, space nuclear safety program, and radioisotopic terrestrial safety program
[LA-7560-PR] N80-10886
PNEUMATIC CONTROL
Method for calculating optimal parameters of high-pressure pneumatic drives
N80-10070
Pneumatic distributor for turbojet engine control system — TU-154 aircraft
N80-10891
Advanced simulator for pilot training [ASPT]: G-seat optimization
[AD-A068475] N80-10233
PNEUMATIC EQUIPMENT
Experimental determination of heat transfer coefficient when emptying gas vessels — study of heat transfer coefficient in pneumatic equipment for compressed gas in a pressure vessel
N80-10030

POLARIZATION
Analysis of method of polarization surveying of water surface oil pollution
[NASA-TM-75708] N80-10686
POLARIZATION [CHARGE SEPARATION]
Experimental review of beam polarization in high energy positron electron storage rings
[SLAC-PUB-2258] N80-10896
POLARIZERS
Frustrated total reflection polarizer for the infrared
N80-10901
POLLUTION CONTROL
Emission reduction
N80-10287
Noise reduction
N80-10288
Investigation into the chemistry of the UV-ozone purification process
[PB-296485/6] N80-10337
Wastewater treatment in coal conversion
[PB-297387/8] N80-10700
Charged membrane, low pressure ultrafiltration to treat acid mine drainage waters
[PB-297209/9] N80-10703
Fabric filter model sensitivity analysis
[PB-297755/1] N80-10704
The economic impact of proposed regulations to reduce particulate emissions from steel mills and industrial fugitive sources, R78-11
[PB-296527/5] N80-10705
Analysis of priority pollutants at a primary aluminum production facility
[PB-297491/3] N80-10707
Critical research needs in community water management
[PB-295984/9] N80-10973
POLLUTION MONITORING
Regional air pollution study. Dichotomous aerosol sampling system
[PB-297316/5] N80-10338
The use of satellites in environmental monitoring of coastal waters
[NASA-CR-162409] N80-10687
Analysis of organic air pollutants by gas chromatography and mass spectroscopy
[PB-296835/2] N80-10699
Regional air pollution, quality assurance audits
[PB-297576/1] N80-10702
Types of aquatic microcosms and their research applications
[CONF-781101-1] N80-10747
POLYATOMIC MOLECULES
Multiple photon process in SF6
N80-10485
Elements of the theory of molecular spectra -- multistomic molecules
[NASA-TM-75686] N80-10866
POLYCARBONATES
Creep and recovery of amorphous polymers -- polymer physics and creep analysis applied to amorphous materials and polycarbonates to discover creep properties
N80-10359
POLYCRYSTALS
Polycrystalline thin film gallium arsenide solar cells
[PB-298168/6] N80-10675
Physical properties data compilations relevant to energy storage. 3: Engineering properties of single and polycrystalline sodium beta and beta-alumina
[PB-297847/6] N80-10946
POLYESTER RESINS
Immobilization of hazardous residuals by encapsulation -- using a polyester matrix
[PB-296642/2] N80-10897
POLYETHYLENES
Models for the migration of paraffinic additives in polyethylene
[PB-297671/0] N80-10372
POLYMER PHYSICS
Creep and recovery of amorphous polymers -- polymer physics and creep analysis applied to amorphous materials and polycarbonates to discover creep properties
N80-10359
POLYMERIC FILMS
Electropolymerization in stationary cells and in packed and fluidized bed electrode cells
N80-10360
POLYMERIZATION
Compound oxidized styrylphosphine -- flame resistant vinyl polymers
[NASA-CASE-MSC-14903-2] N80-10358
Electropolymerization in stationary cells and in packed and fluidized bed electrode cells
N80-10360
POLYMERS
Preparation and characterization of polymer-bound polydentate amines
[AD-A071150] N80-10364
Thermogravimetric analysis of polymers in air
[AD-A070669] N80-10365
Fracture mechanics of inelastic polymers
[AD-A072615] N80-10368
POLYMETHYL METHACRYLATE
Studies on the photodegradation of poly (methyl methacrylate)
[PB-297793/2] N80-10371
POLYSTYRENE
Investigation of the T sub ll (T sub gl relaxation of homopolymers and block copolymers of styrene by torsional braid analysis
[AD-A072875] N80-10363
POLYURETHANE FOAM
Investigation of microtubular ceramic structures -- fabricating heat exchangers using polyurethane foam and ceramic coatings
[AD-A072144] N80-10369
PONDS
Solar pond concepts: Old and new
[SERI/TP-35-208] N80-10663
Performance and upgrading of wastewater stabilization ponds -- conferences
[PB-297304/3] N80-10977
POPULATION INVERSION
A study of soft X-ray laser schemes in multi-component laser plasmas -- population inversions from laser plasma interactions
N80-10913
PORTABLE LIFE SUPPORT SYSTEMS
Portable breathing system -- a breathing apparatus using a rebreathing system of heat exchangers for carbon dioxide removal
[NASA-CASE-MSC-14182-1] N80-10799
POSITION [LOCATION]
Determining photograph locations over oceans
N80-10561
Algorithms for locating celestial sources of X-rays and gamma flares with the aid of several spacecraft
[NASA-TM-75920] N80-10991
POSITION INDICATORS
Algorithms and logic for incorporating ILS NASA TCV B-737 airplane area navigation system
[NASA-TM-80167] N80-10152
JTIDS expendable/low cost terminal development
N80-10187
POTABLE WATER
Preprototype vapor compression distillation subsystem -- recovering potable water from wastewater
[NASA-CR-160332] N80-10801
Critical research needs in community water management
[PB-295984/9] N80-10973
POTENTIAL ENERGY
Analytic coherent states for generalized potentials -- motion of a classical particle
[LA-UR-79-218] N80-10951
POTENTIAL FLOW
Motion of rectangular wing between parallel walls
N80-10030
Acceleration of transonic potentials flow calculations on arbitrary meshes by the multiple grid method
[AD-A072901] N80-10142
POWDER [PARTICLES]
Analysis and computerized fitting of the lineshape of the NMR powder pattern
[IS-4516] N80-10874
POWDERED ALUMINUM
Aluminum combustion under rocket motor conditions
N80-10294
Combustion of aluminum in solid propellant flames
N80-10295
The role of particulate damping in the control of combustion instability by aluminum combustion
N80-10296
POWER LINES
AC superconducting cables
[BNL-26016] N80-10441
The 50kA flux pump for the superconducting transmission line test bed
[LA-6953-MS] N80-10443
POWER SPECTRA
X-band sampling by the occultation data assembly
N80-10264
The spherical wave phase difference temporal power spectra for light beams degraded by a turbulent atmosphere
N80-10898
POWERED LIFT AIRCRAFT
Workshop on Thrust Augmenting Ejectors
[NASA-CP-2093] N80-10107
PRANDTL-MEYER EXPANSION
Two-dimensional flow past convex and concave corners at transonic speed and two-dimensional flow around a parabolic nose at subsonic and transonic speeds
N80-10092
PRECIPITATION
Flow on magnetizable particles in turbulent air streams
[NASA-CR-162418] N80-10461
PRECIPITATION HARDENING
Thermodynamics of precipitation systems -- thermodynamic properties of precipitation hardening in binary systems
[ORNL-5537] N80-10955
PREDICTION ANALYSIS TECHNIQUES
Estimation of attainable leading-edge thrust for wings at subsonic and supersonic speeds
[NASA-TP-1508] N80-10105
DSS receiver thermal noise model comparisons
N80-10262
Implications of possible shuttle charging -- prediction analysis techniques for insulation and electrical grounding against ionospheric conductivity
[NASA-CR-161283] N80-10277
Properties of steady, viscosity stratified flow to a line sink -- prediction analysis techniques for velocity distribution
N80-10455
An investigation of the effects of internal solidification on turbulent-flow heat transfer and pressure drop in a horizontal tube -- prediction analysis techniques for pressure reduction
N80-10456
Thermal conductivity of the helium-argon system -- prediction analysis techniques for thermal conductivity of argon helium gas mixtures
[ANL-79-3] N80-10953
PREDICTIONS
Prediction of aerodynamic forces on a circular cylinder and thin airfoil in a transonic airstream by the finite element method
N80-10093
PREMIXED FLAMES
Analytical modeling of flash-back phenomena -- premixed/prevaporized combustion system
[NASA-CR-162309] N80-10330
PRESSURE
Pressure and velocity measurements in a three-dimensional wall jet
N80-10126
PRESSURE CHAMBERS
Toxic effects of chemicals in the altered gas environment of pressurized chambers
N80-10775
PRESSURE DISTRIBUTION
Laminar boundary layer calculation from experimental pressure distribution
N80-10045
Linearized unsteady jet analysis
N80-10118
PRESSURE MEASUREMENTS
Pressure and velocity response function measurements by the rotating valve method
N80-10312
PRESSURE OSCILLATIONS
Heat transfer in turbulent gas flows with high-frequency pressure oscillations
N80-10064
Low frequency oscillatory combustion: Experiments and results
N80-10305
PRESSURE RECOVERY
On the rational design of compressible flow ejectors
N80-10114
PRESSURE REDUCTION
An investigation of the effects of internal solidification on turbulent-flow heat transfer and pressure drop in a horizontal tube -- prediction analysis techniques for pressure reduction
N80-10456
PRESSURE VESSELS
Experimental determination of heat transfer coefficient when emptying gas vessels -- study of heat transfer coefficient in pneumatic equipment for compressed gas in a pressure vessel
N80-10030
Computer model for ductile fracture -- nuclear reactor pressure vessels
[UCID-18970] N80-10526
Stress analysis of cylindrical pressure vessels with closely spaced nozzles by the finite-element method. Volume 3: Vessels with three nozzles under internal pressure and external loadings
[NUREG-CR-0307-VOL-3] N80-10527
PRIMARY BATTERIES
Lithium batteries: Citations from the Engineering Index data base
[NTIS/PS-79/0676/1] N80-10666
Lithium batteries. Volume 3: Citations from the NTIS data base
[NTIS/PS-79/0675/3] N80-10672
PRINTOUTS
An improved FORTRAN reorganizer
[AD-A071334] N80-10822
PROBABILITY DENSITY FUNCTIONS
On rates of convergence in the L2 norm of nonparametric probability density estimates
[AD-A072134] N80-10848
Convergence rate for the mean integrated squared errors of some nonparametric density estimators of recursive delta-function type
[AD-A072133] N80-10849
A variation on Scheffe's theorm with application to nonparametric density estimation
[AD-A072132] N80-10850
PROBABILITY THEORY
Time series analysis by the maximum entropy method
[ORNL-5332] N80-10950

PROBLEM SOLVING
Integral solutions of the high Reynolds number small separation problem
N80-10099
An aptitude-strategy interaction in linear syllogistic reasoning
[AD-A068498] N80-10791
PRODUCT DEVELOPMENT
The development of aluminum-aluminum oxide alloys by mechanical alloying
N80-10340
PRODUCTION PLANNING
Economic structure, aggregate production functions and the demand for energy as an intermediate product: A preliminary analysis
[DOE/EIA-0103/8] N80-10607
PROFILE METHOD [FORECASTING]
IFR aircraft handled forecast by air route traffic control center, fiscal years 1979-1990
[AD-A070786] N80-10153
PROGRAMMING LANGUAGES
NPS-PASCAL: A pascal implementation for microprocessor-based computer systems
[AD-A071972] N80-10806
BEYSIK: Language description and handbook for programmers [system for the collective use of the Institute of Space Research, Academy of Sciences USSR]
[NASA-TM-75680] N80-10813
The design and verification of an operating system kernel
[AD-A072552] N80-10819
VAL: A value-oriented algorithmic language [preliminary reference manual]
[AD-A072994] N80-10826
PROJECT MANAGEMENT
Managerial plan: Executive order 12003 and the National Energy Act
[DOE/TIC-10067] N80-10965
PROJECT PLANNING
The requirements and feasibility of business planning in the office of space and terrestrial applications
[NASA-CR-162388] N80-10852
PROPAGATION MODES
Propagation of waves in a medium with high radiation pressure
[NASA-TM-75679] N80-10982
PROPANE
Photographic combustion characterization of LOX/hydrocarbon type propellants
[NASA-CR-160318] N80-10378
PROPELLANT COMBUSTION
Technical evaluation report on the Propulsion and Energetics Panel 53rd Symposium on Solid Rocket Motor Technology
[AGARD-AR-151] N80-10280
Photographic combustion characterization of LOX/hydrocarbon type propellants
[NASA-CR-160318] N80-10378
X-ray spectroscopy as a diagnostic tool in solid propellant combustion flows
[AD-A070796] N80-10380
PROPELLANT GRAINS
Aluminum combustion under rocket motor conditions
N80-10294
PROPELLANT PROPERTIES
Improving the all weather ballistic and mechanical properties of smokeless propergols
N80-10300
PROPELLANT STORABILITY
The ageing behaviour of solid rocket propellants regarding their mechanical properties
N80-10299
PROPELLANT TESTS
Improving the all weather ballistic and mechanical properties of smokeless propergols
N80-10300
Pressure and velocity response function measurements by the rotating valve method
N80-10312
PROPULSION
Computational fluid mechanics of internal flow
N80-10211
Instrumentation technology
N80-10214
Control technology
N80-10215
PROPULSION SYSTEM CONFIGURATIONS
Recent developments in ejector technology in the Air Force: An overview
N80-10108
Supersonic propulsion technology — variable cycle engines
N80-10216
Hypersonic propulsion — supersonic combustion ramjet engines
N80-10217
Vertical Takeoff and Landing [VTOL] propulsion technology
N80-10218
High-performance-vehicle technology — fighter aircraft propulsion
N80-10219
The use of standardized test motors and laboratory tools in the development of missile propulsion technology
N80-10315
PROPULSION SYSTEM PERFORMANCE
Aeropropulsion 1979 — conference
[NASA-CP-2092] N80-10205
Supersonic propulsion technology — variable cycle engines
N80-10216
Hypersonic propulsion — supersonic combustion ramjet engines
N80-10217
Vertical Takeoff and Landing [VTOL] propulsion technology
N80-10218
High-performance-vehicle technology — fighter aircraft propulsion
N80-10219
The use of standardized test motors and laboratory tools in the development of missile propulsion technology
N80-10315
Effect of time dependent flight loads on JTVD-7 performance deterioration
[NASA-CR-159681] N80-10515
PROPULSIVE EFFICIENCY
Recent developments in ejector technology in the Air Force: An overview
N80-10108
NASA overview
N80-10109
PROTECTIVE CLOTHING
Revised height/weight sizing programs for men's protective flight garments
[AD-A070732] N80-10803
PROTECTIVE COATINGS
The development of Amiguard, a clear, water displacing, corrosion preventive compound
[AD-A071617] N80-10347
PROTEINS
Levels and proportion of RNA and proteins in the system of the neuron: Vestibular nuclear neuroglia and cerebellum during hypokinesia
N80-10764
PROTON BEAMS
Material response to 500 keV proton beams at intensities below 1 GW/cm2
[AD-A072416] N80-10520
PROTON IMPACT
Diffraction dissociation of high energy proton on helium
[CONF-780826-10] N80-10870
PROTON MASERS
Demonstration of remote clock monitoring by VLBI, with three baseline closure
N80-10247
PROTON SCATTERING
Proton deuteron elastic scattering from 20 to 220 GeV/c
N80-10863
Proton-helium elastic scattering from 40 to 400 GeV
[CONF-780826-9] N80-10871
PROTONS
Mechanisms of proton stability and decay in unified models
[LA-UR-79-361] N80-10875
PSYCHOLOGY
Identification and validation of quantitative measures of the psychological complexity of software
[AD-A072547] N80-10825
PSYCHOMETRICS
USSR Report: Biomedical and Behavioral Sciences, no. 122 — emphasizing pharmacology in space flight, psychometric test equipment, and air filters
[JPRS-74365] N80-10748
A portable stand for assessing the dynamics of a working individual's functional state — based on a microprocessor
N80-10750
An aptitude-strategy interaction in linear syllogistic reasoning
[AD-A068498] N80-10791
PSYCHOPHYSIOLOGY
Age-related distinctions of changes in psychophysiological functions of pilots in the civil aviation under the influence of vibration and noise
N80-10757
Research on the psychophysiological basis of human vigilance
[AD-A068562] N80-10790
Evoked cortical potentials and information processing
[AD-A070789] N80-10794
PULMONARY CIRCULATION
The extended Kalman filter as pulmonary blood flow estimator
N80-10779
PULSE COMMUNICATION
JTIDS: The issue of frequency selection — low frequency assignment for pulse communication navigation aids
N80-10183
JTIDS signal structure
N80-10184
Command and control terminals — systems engineering of command and control terminals for pulse communication navigation aids
N80-10185
An/URQ-28 JTIDS class 2 tactical terminal — systems engineering of time division multiple access and TACAN signal processing for pulse communication navigation aids
N80-10186
Distributed TDMA: An approach to JTIDS phase 2
N80-10189
JTIDS II/DTDMA - command and control terminals
N80-10190
JTIDS II/DTDMA tactical terminal
N80-10191
The 30/20 GHz mixed user architecture development study
[NASA-CR-159686] N80-10413
The 30/20 GHz mixed user architecture development study: Executive summary
[NASA-CR-159687] N80-10416
PULSE DURATION
Variation of seismic source parameters and stress drop within a descending slab as revealed from body-wave pulse-width and amplitude analysis, part 1. A seismological investigation of the subduction mechanism of aseismic ridges, part 2
N80-10710
PULSE MODULATION
The R sub 0 parameter for optical communication using photon counting
N80-10249
PULSED LASERS
High peak power pulsed WIP electron gun
[UCRL-13950] N80-10877
PUMPS
Measurement of liquid pump torque in the starting regime
N80-10066
Continuous coal processing method and means
[NASA-CASE-NPO-13758-2] N80-10377
PYRITES
Studies of the abnormally high peak voltage observed with Fe32 depolarized thermal batteries
[SAND-79-0896] N80-10641
PYROLYSIS
Molten salt pyrolysis of latex — for hydrocarbon fuel production
[NASA-CASE-NPO-14315-1] N80-10361
PYROTECHNICS
A safety practices manual for the manufacturing, transportation, storage, and use of pyrotechnics
[PB-297807/0] N80-10399

Q

Q SWITCHED LASERS
Development of an actively modelocked and Q-switched oscillator for laser fusion program at LLL
[UCRL-81365] N80-10490
QUADRATIC EQUATIONS
On minimizing integral quadratic estimates
N80-10051
QUALITY CONTROL
Alternative jet aircraft fuels
N80-10209
Error control systems for multi-access communication channels — quality control error detection codes for multichannel communication
N80-10409
Quality assurance in alternative energy sources
[RHO-SA-107] N80-10504
QUANTITATIVE ANALYSIS
Bichromate oxidability as a criterion of quantitative levels of organic impurities in reclaimed water
N80-10766
QUANTUM CHROMODYNAMICS
Asymptotic freedom without guilt — quantum chromodynamics and quark confinement
[UH-511-329-79] N80-10952
QUANTUM ELECTRODYNAMICS
Joint services electronics program — a bibliography with abstracts
[AD-A072076] N80-10438
Quantum electrodynamics and light rays
[ORO-3992-354] N80-10949
QUANTUM MECHANICS
High temperature science: Future needs and anticipated development in high-density shock-wave research
[UCID-18072] N80-10857
QUARKS
Asymptotic freedom without guilt — quantum chromodynamics and quark confinement
[UH-511-329-79] N80-10952
QUEUEING THEORY
Continuous simulation of queueing networks with transient and time varying conditions
N80-10833
Application of queueing models to multiprogrammed computer systems operating in a time-critical environment
[NASA-TM-80143] N80-10854

R

RADAR CROSS SECTIONS
Shuttle orbiter radar cross-sectional analysis
[NASA-TM-72870] N80-10276
RADAR IMAGERY
Quasi-three-dimensional display of infrared radar images using range/intensity color mapping
[AD-A078671] N80-10417
RADAR RECEIVERS
DSS receiver thermal noise model comparisons
N80-10262
RADAR SCATTERING
Lunar radar backscatter studies
[NASA-CR-162415] N80-10986
RADAR TRACKING
Shuttle orbiter radar cross-sectional analysis
[NASA-TM-72870] N80-10276
The design of an optimal observer for linear discrete time dynamical systems — designing airadar tracking system
[AD-A072066] N80-10422
RADIATION COUNTERS
The R sub 0 parameter for optical communication using photon counting
N80-10249
RADIATION DISTRIBUTION
Results and interpretation of measurements of the light flux in the near-surface layer of the Venusian atmosphere
[NASA-TM-75716] N80-10988
RADIATION EFFECTS
Studies on the photodegradation of poly (methyl methacrylate)
[PB-297793/2] N80-10771
Fiber optic utilization at the Nevada Test Site — radiation effects on underground cables for analog data transmission
[LA-7029-MS] N80-10912
RADIATION HAZARDS
General-purpose heat source project, space nuclear safety program, and radioisotopic terrestrial safety program
[LA-7560-PR] N80-10886
RADIATION MEASURING INSTRUMENTS
Study of the optimum charge-transfer image sensor — photoelectric radiation measuring instruments with bucket brigade devices for imaging techniques
N80-10431
RADIATION PRESSURE
Propagation of waves in a medium with high radiation pressure
[NASA-TM-75679] N80-10982
RADIATION PROTECTION
A method of defining the optimum level of ionizing radiation from determinate sources during space flights
N80-10770
RADIATION SOURCES
Algorithms for locating celestial sources of X-rays and gamma flares with the aid of several spacecraft
[NASA-TM-75920] N80-10991
RADIO ASTRONOMY
Radio astronomy
N80-10244
RADIO COMMUNICATION
Possibility of using bone conduction in aviation radio communication — cranial bone transducers
N80-10755
RADIO FREQUENCIES
A voltage-controlled optical radio frequency-phase shifter
N80-10245
RADIO FREQUENCY HEATING
Fast magnetosonic wave heating of the NUWMAK tokamak reactor
[UWFDM-227] N80-10923
RADIO NAVIGATION
Principles and operational aspects of precision position determination systems
[AGARD-AG-245] N80-10154
Radio navigation systems: Current status
N80-10155
RADIO RECEIVERS
Phase 2 GPS receiver design philosophy
N80-10171
RADIO TELESCOPES
Temperature deformations of the mirror of a radio telescope antenna
[NASA-TM-75633] N80-10908
RADIOACTIVE WASTES
Quality assurance in alternative energy sources
[RHO-SA-107] N80-10304
Acid digestion of combustible waste
[HEDL-TME-79-77] N80-10614
Risk methodology for geologic disposal of radioactive waste: The Sandia Waste Isolation Flow and Transport (SWIFT) model
[SAND-78-1267] N80-10884
Subgroup report on alternative technology strategies for the isolation of nuclear waste
[TID-28818] N80-10885
Experimental joule-heated ceramic melter for converting radioactive waste to glass
[DP-MS-79-59] N80-10888
Application of microwave energy to post-calcination treatment of high-level nuclear wastes — pellet drying and glass vitrification
[ICP-1103] N80-10889
Development of cermets for high level radioactive waste fixation
[CONF-790620-10] N80-10890
Risk analysis methodology and data: Study of alternatives for long-term management of Hanford defense high-level radioactive waste
[WSC-PS-ARH-77001] N80-10891
Immobilization of hazardous residuals by encapsulation — using a polyester matrix
[PB-296642/2] N80-10897
Sandia irradiator for Dried Sewage Solids
[SAND-79-0182] N80-10971
RADIOMETERS
Spectral radiometric measurement and analysis program. Volume 2: Description of the data collection program
[AD-A072079] N80-10731
RAMAN SPECTRA
Remote sensing of LNG spill vapor dispersion using Raman LIDAR
[UCRL-13904] N80-10689
Magnetic field studies of electronic Raman scattering in rare-earth zircons
N80-10930
RANGE ERRORS
An experimental investigation of the effects of antenna pointing errors on range delays — error analysis of range errors in directional antennas due to time lag
N80-10259
RANGE FINDERS
Integrated Tactical Navigation Systems (ITNS) — performance tests of navigation aids for rangefinding for air and surface navigation
N80-10182
RANGEFINDING
Integrated Tactical Navigation Systems (ITNS) — performance tests of navigation aids for rangefinding for air and surface navigation
N80-10182
Refraction corrections for surveying
[NASA-TM-80803] N80-10907
RARE EARTH COMPOUNDS
Magnetic and superconducting transitions in the rare earth rhodium boride compounds
N80-10927
Magnetic field studies of electronic Raman scattering in rare-earth zircons
N80-10930
RATS
Effect of space flight conditions on deoxyribonucleoprotein and nucleic acid content of rat tissues
N80-10760
Reactions of rats to overbearing following prolonged hypokinesia
N80-10761
Effect of hypokinesia on higher nervous activity of albino rats
N80-10762
The combined effect of carbon monoxide and hypokinesia
N80-10763
Levels and proportion of RNA and proteins in the system of the neuron: Vestibular nuclear neuroglia and cerebellum during hypokinesia
N80-10764
RAYLEIGH NUMBER
Stellar convection 3: Convection at large Rayleigh numbers
[NASA-CR-162253] N80-10980
RAYLEIGH WAVES
Source and propagation effects of Rayleigh waves from central Asian earthquakes — and the geological structure of New England
[AD-A070241] N80-10714
REACTION KINETICS
Analysis of flame stabilization conditions using the homogeneous reactor model
N80-10017
The relationship between excitation intensity and photochromic glass kinetics
[PM-692] N80-10362
Transient phenomena in thermal explosion of confined gases
N80-10373
REACTOR DESIGN
Coal conversion processes and analysis methodologies for synthetic fuels production — technology assessment and economic analysis of reactor design for coal gasification
[NASA-CR-161322] N80-10379
Safeguards methodology development history — computerized simulation of safety factors in reactor design for reactor safety
[SAND-79-0059C] N80-10892
REACTOR MATERIALS
Stainless steel blanket concept for tokamaks
[WFPS-TME-79-010] N80-10919
REACTOR SAFETY
Safeguards methodology development history — computerized simulation of safety factors in reactor design for reactor safety
[SAND-79-0059C] N80-10892
REAL TIME OPERATION
Math modeling and computer mechanization for real time simulation of rotary-wing aircraft
[NASA-CR-163400] N80-10137
Method of time series modelling, parameter and state estimation of nonlinear systems — for real time Naval combat weapon systems
N80-10853
Application of queueing models to multiprogrammed computer systems operating in a time-critical environment
[NASA-TM-80143] N80-10854
REBREATHING
Portable breathing system — a breathing apparatus using a rebreathing system of heat exchangers for carbon dioxide removal
[NASA-CASE-MSC-16182-1] N80-10799
RECEIVERS
Texas instruments phase I GPS user equipment
N80-10169
GPS receiver operation
N80-10170
Performance enhancement of the GPS receiver by data-free operation
N80-10172
Application of GPS to low cost tactical weapons
N80-10174
Self-calibrating threshold detector — signal detectors for use with receivers using a demodulator for signal encoding
[NASA-CASE-MSC-16370-1] N80-10413
RECOVERY PARACHUTES
Parachute-rocket deceleration system design
N80-10859
RECRYSTALLIZATION
The development of aluminum-aluminum oxide alloys by mechanical alloying
N80-10340
RECTANGULAR WINGS
Motion of rectangular wing between parallel walls
N80-10850
RECURSIVE FUNCTIONS
The design of an optimal observer for linear discrete time dynamical systems — designing airadar tracking system
[AD-A072066] N80-10422
Convergence rate for the mean integrated squared errors of some nonparametric density estimators of recursive delta-function type
[AD-A072133] N80-10849
RECYCLING
Waste utilization as an energy source. Citations from the International Aerospace Abstracts Data Base
[NTIS/PS-79/0765/2] N80-10667
RED SEA
Marda fault zone and the opening of the Red Sea
N80-10541
REENTRY VEHICLES
Meteorological data analysis in support of the ABRES Program
[AD-A070946] N80-10729
REFLECTANCE
Estimate of total reflectance from the Orinoco River outflow — from Apollo Soyuz Test Project photographs
N80-10569
REFRACTION
An experimental study of optical phase fluctuations in a random refractive field — optical measurement of phase deviation in optical paths during refraction
N80-10905
REFRACTIVITY
The spherical wave phase difference temporal power spectra for light beams degraded by a turbulent atmosphere
N80-10898
An experimental study of optical phase fluctuations in a random refractive field — optical measurement of phase deviation in optical paths during refraction
N80-10905
REFRACTORY MATERIALS
Material problems in jet vane thrust vector control systems
N80-10308
REFRIGERATING MACHINERY
Development of a high temperature solar powered water chiller. Volume 3: Phase I
[SAN-1590-1/3-VOL-3] N80-10654
REGENERATIVE COOLING
Warmup of LRE chambers with regenerative cooling
N80-10087
REGENERATORS
Study of heat-pipe heat exchanger in the small gas turbine engine system
N80-10022
REGIONAL PLANNING
LANDSAT project, State of Hawaii: A preliminary report
[PB-296712/3] N80-10387

REGRESSION ANALYSIS
On estimating variance of robust estimators when the errors are asymmetric
[AD-A072998] N80-10839
REGULATIONS
Factors affecting the retirement of commercial transport jet aircraft
[NASA-CR-152300] N80-10148
REINFORCEMENT (STRUCTURES)
Structural stiffening as an interior noise control technique for light twin-engine aircraft
N80-10192
REINFORCING FIBERS
Analyses of plates constructed of fiber-reinforced laminae/core composite materials
[AD-A071377] N80-10320
Finite-element analysis of laminated composite-material plates
[AD-A071390] N80-10321
RELATIVISTIC ELECTRON BEAMS
Two-dimensional nonstationary model of the propagation of an electron beam in a vacuum
[NASA-TM-75093] N80-10435
RELAXATION (MECHANICS)
Nonlinear spectroscopy
[AD-A071282] N80-10334
RELIABILITY ENGINEERING
Reliability of nondestructive inspections
[AD-A072097] N80-10503
REMOTE HANDLING
Improvements in remote equipment torquing and fastening
[CONF-781105-64] N80-10499
REMOTE MANIPULATOR SYSTEM
Improvements in remote equipment torquing and fastening
[CONF-781105-64] N80-10499
REMOTE SENSORS
Cluster analysis based on density estimates and its application to landsat imagery
N80-10533
Color of desert surfaces in the Arabian peninsula
N80-10538
Monte Desert of San Juan, Argentina, as photographed by ASTP
N80-10539
Dunes and other windforms of central Australia, and a comparison with linear dunes on the Moenkopi Plateau, Arizona
N80-10560
Remote sensing applied to agricultural resources. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0733/0] N80-10588
The use of satellites in environmental monitoring of coastal waters
[NASA-CR-162409] N80-10687
Evaluation of atmospheric trace constituent sensors operating from remote space and airborne platforms
[NASA-CR-162365] N80-10711
Evaluation of the passive remote crosswind sensor -- detecting the movement of atmospheric scintillations
[AD-A071174] N80-10730
REMOTELY PILOTED VEHICLES
Visual search performance in simulated remotely piloted vehicle utilization as a function of auxiliary task loading on the observer
[AD-A072002] N80-10804
RENAL FUNCTION
Effect of hypoxia on fluid-electrolyte metabolism and renal function in man as related to different degrees of motor activity
N80-10754
RESEARCH MANAGEMENT
Research investigation directed toward extending the useful range of the electromagnetic spectrum
[AD-A071664] N80-10421
Quality assurance in alternative energy sources
[RISO-SA-107] N80-10504
Natural gas reserves estimates: A good federal program emerging, but problems and duplications persist
[PB-296628/2] N80-10679
Proposed research planning format for the Environmental Assessment Department — needs and concerns of groups concerned with environment and energy issues
[EPRI-EA-1018] N80-10692
RESERVOIRS
Influence of pumped storage flows on thermal stratification in reservoirs
[PB-297131/5] N80-10792
RESISTANCE HEATING
Experimental joule-heated ceramic melter for converting radioactive waste to glass
[DP-MS-79-59] N80-10888
RESISTORS
The noise properties of thick film resistors
N80-10428
RESONATORS
Electrochemical copper coatings for surface finishing of hf resonators
[LA-UR-79-10] N80-10352
RESOURCES MANAGEMENT
Optimization of computer operating systems
[AD-A071463] N80-10834
The application of an additive-ultimate model to the evaluation of transportation system management strategies
N80-10966
RESPIRATION
Investigation of alveolar-arterial difference for oxygen and carbon dioxide when breathing high-density gas mixtures
N80-10774
REVERSED FLOW
On the influence of liquid oscillations in fuel line on the head of a pump operating in regimes with reverse flow
N80-10810
Prediction of unsteady turbulent boundary layers with flow reversal
[AD-A072508] N80-10483
REYNOLDS NUMBER
Integral solutions of the high Reynolds number small separation problem
N80-10899
RHENIUM ALLOYS
High temperature tungsten-rhenium thermocouples with molybdenum-rhenium sheaths
[TFBP-TR-285] N80-10402
RHODIUM COMPOUNDS
Magnetic and superconducting transitions in the rare earth rhodium boride compounds
N80-10927
RIBONUCLEIC ACIDS
Levels and proportion of RNA and proteins in the system of the neurons: Vestibular nuclear neuroglia and cerebellum during hypokinesia
N80-10764
RIGID STRUCTURES
Nonlinear inelastic stability of flexibly-connected plane steel frames
N80-10508
User's guide: SPAR processor MN analysis of inelastic three-dimensional solids, part 2
[NASA-CR-161321] N80-10514
RIO GRANDE [NORTH AMERICA]
The 1978 symposium on the Rio Grande Rift. Program and abstracts
[LA-7487-C] N80-10716
RISK
Risk methodology for geologic disposal of radioactive waste: The Sandia Waste Isolation Flow and Transport (SWIFT) model
[SAND-78-1267] N80-10884
Risk analysis methodology and data: Study of alternatives for long-term management of Hanford defense high-level radioactive waste
[WSC-PS-ARH-77001] N80-10891
RIVERS
ASTP at Barbados: Mesoscale pools of Amazon River water in the western tropical Atlantic
N80-10568
Estimate of total reflectance from the Orinoco River outflow — from Apollo Soyuz Test Project photographs
N80-10569
Detection of a probable ancestral delta of the Nile River
N80-10571
Suspended-sediment dispersal patterns of river deltas photographed by ASTP
N80-10572
South American river morphology and hydrology
N80-10574
ROCKET ENGINE CASES
Composites in future motor hardware: A research view
N80-10309
ROCKET ENGINE DESIGN
Solid rocket motor design automation technology
N80-10283
Solid propellant specific impulse prediction
N80-10286
The use of standardized test motors and laboratory tools in the development of missile propulsion technology
N80-10315
ROCKET ENGINES
Correlation of experimental data on two-phase-flow heat transfer in convergent part of a nozzle
N80-10021
Nonlinear combustion instability in solid propellant rocket motors: Influence of geometry and propellant formulation
N80-10306
Measurement of thrust transients in rocket motors
N80-10316
ROCKET LAUNCHING
The 19304D GSRS missile number 1026, round number v-25
[AD-A071425] N80-10720
The 19835D GSRS, missile number 1020, round number V-21
[AD-A070599] N80-10722
The 19304D GSRS, missile number 1023, round number V-23
[AD-A070558] N80-10723
The 19702A GSRS, missile number 087, round number B-11
[AD-A070549] N80-10726
The [FA] 19304 GSRS, missile number 1019, round number V-20
[AD-A070830] N80-10727
The 12823A lance missile number 4724 round number 332 NCL
[AD-A072044] N80-10738
ROCKET NOZZLES
Propulsive nozzle electrification
N80-10049
A simple method to estimate the influence of a small variation in the throat area on the performance of solid rockets
N80-10287
ROCKET PROPELLANTS
Ultrasonic imaging as applied to non-destructive testing of rocket propellants
N80-10313
ROCKET SOUNDING
Lance missile no. 4388, round no. 330 ACL
[AD-A071335] N80-10733
ROCKET THRUST
Measurement of thrust transients in rocket motors
N80-10316
ROLL
Experiments in sensing transient rotational acceleration cues on a flight simulator
[NASA-TP-1537] N80-10193
Light airplane crash tests at three roll angles
[NASA-TP-1477] N80-10512
ROLL FORMING
The relationships of the process variables and material properties on clad-rolled metals
N80-10343
ROLLER BEARINGS
Antenna azimuth bearing model experiment
N80-10257
ROTARY WING AIRCRAFT
Math modeling and computer mechanization for real time simulation of rotary-wing aircraft
[NASA-CR-162400] N80-10137
ROTARY WINGS
A flight investigation of performance and loads for a helicopter with NLR-IT main-rotor blade sections
[NASA-TM-80165] N80-10136
Coupled rotor and fuselage equations of motion
[NASA-TM-81153] N80-10516
ROTATING DISKS
Use of the method of variable directions for numerical study of the temperature states of a turbine disk with blades — temperature distribution of rotating disk turbine blades using linear transformation
N80-10028
ROTOR AERODYNAMICS
Experimental study of the gasdynamic characteristics of a stator cascade with cooling air discharge through the vane surface
N80-10009
ROTOR BLADES [TURBOMACHINERY]
Long-life GTE operation based on technical condition — fatigue and service life monitoring of turbine blades in aircraft engines
N80-10027
Computer calculation of stationary temperature fields in air-cooled turbine rotor blades
N80-10067
On the influence of short shroud platforms on turbine stage operation — performance tests for shrouded rotor blades on gas turbine engines
N80-10083
On axial turbine stage rotor blade twist with tangential tilt of the stator vanes
N80-10086
Nonstationarity of heat transfer in axial turbine blading during engine startup
N80-10089
Instrumentation technology
N80-10214
Contact stress analysis of ceramic-to-metal interfaces
[AD-A072073] N80-10522
ROTOR SPEED
Cross flow fan experiment development and finite element modeling
N80-10096
RUBBER
Morphology of rubber modified epoxy encapsulants
[SAND-79-0158C] N80-10370
RUNGE-KUTTA METHOD
Integral solutions of the high Reynolds number small separation problem
N80-10899
RUNWAYS
A literature search and review of the dynamics of aircraft-surface interaction
[AD-A070940] N80-10199

S

SAFEGUARD SYSTEM
Safeguards methodology development history — computerized simulation of safety factors in reactor design for reactor safety
[SAND-79-0859C] N80-10892

SAFETY FACTORS
General-purpose heat source project, space nuclear safety program, and radioisotopic terrestrial safety program
[LA-7560-PR] N80-10886
Safeguards methodology development history — computerized simulation of safety factors in reactor design for reactor safety
[SAND-79-0859C] N80-10892
SAFETY MANAGEMENT
A safety practices manual for the manufacturing, transportation, storage, and use of pyrotechnics
[PB-297807/0] N80-10999
SALTS
Physical properties data compilations relevant to energy storage, 2. Molten salts: Data on single and multi-component salt systems
[NSRDS-NBS-61-PT-2] N80-10643
SAN FRANCISCO BAY [CA]
Example control strategy for ozone. Volume 2: Case study of the San Francisco Bay region, 1976-1978
[PB-297800/5] N80-10706
SANDWICH STRUCTURES
Recent research in composite and sandwich plate dynamics
[AD-A072277] N80-10322
The relationships of the process variables and material properties on clad-rolled metals N80-10343
SATELLITE NAVIGATION SYSTEMS
Global positioning system: Signal structure and performance characteristics N80-10159
The GPS navigation message N80-10160
Clocks: Evolution of frequency standards N80-10161
GPS time N80-10162
Master control station — of the Global Positioning System N80-10163
GPS master control station operations N80-10164
Monitor stations N80-10165
The GPS upload station N80-10166
A time transfer unit for GPS N80-10167
Ephemeris and clock determination in GPS N80-10168
Texas instruments phase 1 GPS user equipment N80-10169
GPS receiver operation N80-10170
Alternate constellations for the global positioning system N80-10177
On the optimal selection of satellites in GPS N80-10178
SATELLITE OBSERVATION
The use of satellites in environmental monitoring of coastal waters
[NASA-CR-162409] N80-10687
SATELLITE ORIENTATION
Alternate constellations for the global positioning system N80-10177
SATELLITE PERTURBATION
Study of periodic motions of a satellite with a magnetic damper
[NASA-TM-75667] N80-10273
SATELLITE POWER TRANSMISSION [TO EARTH]
Satellite Power System [SPS] preliminary societal assessment
[HCP/R4024-01/14] N80-10657
SATELLITE SOLAR POWER STATIONS
Minimum cost transmitter-receiver antenna pairs — antenna design for the satellite solar power station using optimal control theory
[RM-490] N80-10414
SATELLITE TELEVISION
Satellite direct broadcasting: The prospects for development — economic factors of satellite transmissions for direct broadcasting of television N80-10410
SATELLITE TRANSMISSION
Application of GPS to low cost tactical weapons N80-10174
Satellite direct broadcasting: The prospects for development — economic factors of satellite transmissions for direct broadcasting of television N80-10410
The 30/20 GHz mixed user architecture development study
[NASA-CR-159686] N80-10415
The 30/20 GHz mixed user architecture development study: Executive summary
[NASA-CR-159687] N80-10416
SATELLITE-BORNE PHOTOGRAPHY
Apollo-Soyuz test project. Volume 2: Earth observations and photography
[NASA-SP-412-VOL-2] N80-10538
Summary of significant results N80-10539
Geologic analysis of ASTP photographs of parts of southern California N80-10540
Evaluation of satellite images of the Levantine Rift zone N80-10542
Analysis of Skylab and astp photographs of the Levantine [Dead Sea] fault zone N80-10543
Analysis and synthesis of space imagery of the southeastern-Turkey/northwestern-Iran mobile belt N80-10544
SATURN [PLANET]
Pioneer Saturn encounter — Pioneer 11 space probe
[NASA-TM-80807] N80-10239
Pioneer 11 saturn encounter support N80-10243
Saturn's magnetosphere, rings, and inner satellites
[U-OF-IOWA-79-44] N80-10987
SATURN RINGS
Saturn's magnetosphere, rings, and inner satellites
[U-OF-IOWA-79-44] N80-10987
SCALE EFFECT
Observations on parachute scale factors for modeling parachute deployment and steady state performance
[AD-A070571] N80-10130
SCALE MODELS
Low-speed wind-tunnel tests of a 1/10-scale model of an advanced arrow-wing supersonic cruise configuration designed for cruise at Mach 2.2 — Langley Full Scale Wind Tunnel
[NASA-TM-80152] N80-10135
Antenna azimuth bearing model experiment N80-10257
SCATTERING
Atom-surface interactions derived from scattering data N80-10925
SCATTERING COEFFICIENTS
Construction of well-conditioned systems for Fredholm I problems by mesh adapting
[COO-2482-10] N80-10845
SCATTERING CROSS SECTIONS
Proton deuteron elastic scattering from 20 to 220 GeV/c N80-10863
Diffraction dissociation of high energy proton on helium
[CONF-780826-10] N80-10870
Proton-helium elastic scattering from 40 to 400 GeV
[CONF-780826-9] N80-10871
Study of structure of light nuclei with neutrons
[COO-2490-9] N80-10872
Production of hydrogen, deuterium, and helium by 15-MeV neutrons
[COO-2719-5] N80-10873
Modified method of perturbed stationary states I
[SAND-78-0235] N80-10893
SCENE ANALYSIS
A system for control structure implementation for image understanding
[AD-A071603] N80-10885
SCHOTTKY DIODES
Semiconductor millimeter and centimeter wave radiometer for the study of the radiation of an underlying surface
[NASA-TM-75671] N80-10477
SCINTILLATION
Evaluation of the passive remote crosswind sensor -- detecting the movement of atmospheric scintillations
[AD-A071176] N80-10730
SEARCH PROFILES
Deductive planning and pathfinding for relational data bases
[AD-A070801] N80-10927
Summary of the Sandia Materials Information data bank — materials aging and compatibility data
[SAND-78-1961C] N80-10939
SEATS
Advanced simulator for pilot training [ASPT]: G-seat optimization
[AD-A068475] N80-10233
SECONDARY FLOW
Study of mass exchange between primary zone and secondary air jets in gas turbine engine combustion chambers N80-10875
Laser Doppler Velocimeter [LDV] study of secondary flows in turbine cascade N80-10890
SEDIMENT TRANSPORT
Suspended-sediment dispersal patterns of river deltas photographed by ASTP N80-10572
SEISMIC WAVES
Variation of seismic source parameters and stress drop within a descending slab as revealed from body-wave pulse-width and amplitude analysis, part 1. A seismological investigation of the subduction mechanism of aseismic ridges, part 2 N80-10710
SEISMOLOGY
Variation of seismic source parameters and stress drop within a descending slab as revealed from body-wave pulse-width and amplitude analysis, part 1. A seismological investigation of the subduction mechanism of aseismic ridges, part 2 N80-10710
Source and propagation effects of Rayleigh waves from central Asian earthquakes — and the geological structure of New England
[AD-A070241] N80-10714
SELF OSCILLATION
Study of self-oscillatory liquid film flow regime in coaxial air stream N80-10804
SEMICONDUCTOR DEVICES
Joint services electronics program — a bibliography with abstracts
[AD-A072076] N80-10438
Semiconductor millimeter and centimeter wave radiometer for the study of the radiation of an underlying surface
[NASA-TM-75671] N80-10477
Optical-microwave interactions in semiconductor devices
[AD-A072539] N80-10487
SEMICONDUCTOR JUNCTIONS
Rectification at N-N GaAS: (Ga, Al)As heterojunctions
[AD-A071732] N80-10937
Rectification at nGaAs - a Ga.7Al.3As heterojunctions grown by LPE
[AD-A071733] N80-10938
SEMICONDUCTORS [MATERIALS]
Alloys obtained in a state of weightlessness N80-10270
A perspective of a workshop on stability of thin film solar cells and materials
[PB-297396/4] N80-10576
SENSITOMETRY
ASTP photographic film processing and sensitometric summary N80-10580
SEPARATED FLOW
An investigation of corner separation within a thrust augmenter having Coanda jets
[NADC-76153-30] N80-10122
Boundary layer separation. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0813/0] N80-10146
Unsteady laminar-flow separation in tubes. 2: The effect of variations in the frequency and amplitude of flow oscillations
[PB-296968/1] N80-10473
SEPARATORS
Lithium batteries. Volume 2: Citations from the NTIS data base
[NTIS/PS-79/0674/6] N80-10671
SEQUENCING
Mixing conditions and limit theorems for maxima of some stationary sequences
[COO-2874-38] N80-10844
SEQUENTIAL ANALYSIS
Generating covariance sequences and the calculation of quantization and rounding error variances in digital filters
[AD-A072677] N80-10838
SERVICE LIFE
Long-life GTE operation based on technical condition — fatigue and service life monitoring of turbine blades in aircraft engines N80-10027
Factors affecting the retirement of commercial transport jet aircraft
[NASA-CR-152308] N80-10148
SERVOCONTROL
Mathematical model and stability of hydraulic servo drive with jet-throttle regulation N80-10033
SET THEORY
Decision making, fuzzy set theory and computers
[AD-A071842] N80-10815
Cutting planes from conditional bounds: A new approach to set covering
[AD-A072499] N80-10821
SEWAGE
Sandia Irradiator for Dried Sewage Solids
[SAND-79-0182] N80-10971
SEWAGE TREATMENT
Critical research needs in community water management
[PB-293984/9] N80-10973
Municipal Wastewater Treatment Facility, winter 1978
[PB-296813/9] N80-10974
SHALE OIL
Alternative jet aircraft fuels N80-10209
SHAPED CHARGES
Some measurements of ignition delay and heat transfer with pyrogen igniters N80-10290
SHAPES
The turbulent boundary layer on a curvilinear surface N80-10020

SHEAR FLOW
Studies on the mixing in a density-stratified shear flow
N80-10454

SHEAR STRENGTH
The scatter of mechanical values of carbon fiber composites and its causes — statistical values of strength
[NASA-TM-75090] N80-10317

SHOCK WAVES
Experimental investigation of first and second-sound shock waves in liquid helium II
N80-10431

Introduction to hydrodynamics
[UCID-18014] N80-10471

High temperature science: Future needs and anticipated development in high-density shock-wave research
[UCID-18972] N80-10857

Ion acceleration at the earth's bow shock: A review of observations in the upstream region
[LA-UR-79-309] N80-10984

SHORT CIRCUITS
The potential of carbon fiber induced shock hazards in household toasters
[NASA-CR-159147] N80-10434

SHORT TAKEOFF AIRCRAFT
Design and test of a prototype scale ejector wing
N80-10131

SHROUDS
On the influence of short shrouded platforms on turbine stage operation — performance tests for shrouded rotor blades on gas turbine engines
N80-10083

SICLV
Maltese Front and Strait of Sicily ocean pattern analysis
N80-10565

SIDESLIP
Wing-body yawing moment and sideforce derivatives due to sideslip: Nv and Yv
[ESDU-79006] N80-10097

SIGNAL ANALYSIS
JTIDS signal structure
N80-10184

TARADCOM signal analysis program — user manual
[AD-A072014] N80-10817

SIGNAL DETECTORS
Self-calibrating threshold detector — signal detectors for use with receivers using a demodulator for signal encoding
[NASA-CASE-MSC-14370-1] N80-10413

SIGNAL ENCODING
Self-calibrating threshold detector — signal detectors for use with receivers using a demodulator for signal encoding
[NASA-CASE-MSC-14370-1] N80-10413

SIGNAL PROCESSING
An/URQ-28 JTIDS class 2 tactical terminal — systems engineering of time division multiple access and TACAN signal processing for pulse communication navigation aids
N80-10186

The design of an optimal observer for linear discrete time dynamical systems — designing simulor tracking system
[AD-A072046] N80-10422

SIGNAL TO NOISE RATIOS
Performance enhancement of the GPS receiver by data-free operation
N80-10172

Research on adaptive antenna techniques 2
[AD-A071338] N80-10419

SIGNAL TRANSMISSION
Global positioning system: Signal structure and performance characteristics
N80-10159

The GPS navigation message
N80-10160

Master control station — of the Global Positioning System
N80-10163

GPS master control station operations
N80-10164

SILICON
Novel duplex vapor: Electrochemical method for silicon solar cells — chemical reactor for a silicon sodium reaction system
[NASA-CR-162387] N80-10597

Silicon ingot casting heat exchanger method, multi-wire slicing, fixed abrasive slicing technique, phase 3
[NASA-CR-162398] N80-10598

Study of internal friction in single crystal silicon
N80-10928

SILICON NITRIDES
Improving the stress rupture and creep of silicon nitride — turbine materials
[NASA-CR-159585] N80-10318

Development of silicon nitride of improved toughness
[NASA-CR-159678] N80-10319

SINGLE CRYSTALS
The effect of point contact surface damage on the work hardening of copper crystals
N80-10339

Study of internal friction in single crystal silicon
N80-10928

Growth of bismuth tungstate single crystals — hydrothermal crystal growth of single crystals
[COO-1198-1261] N80-10940

SITES
Applications analysis of fixed site hydrogen storage
[SAND-78-8272] N80-10584

SIZE [DIMENSIONS]
Study of heat-pipe heat exchanger in the small gas turbine engine system
N80-10022

SKIN [ANATOMY]
Thermal conduction effects in human skin. Phase 2: Experimental validation and application of data in selection of materials
[AD-A082480] N80-10783

SLENDER WINGS
Technical evaluation report on the fluid dynamics panel Symposium on High Angle of attack aerodynamics — slender wings, bodies of revolution, and body-wing configurations
[AGARD-AR-145] N80-10147

SLICING
Silicon ingot casting heat exchanger method, multi-wire slicing, fixed abrasive slicing technique, phase 3
[NASA-CR-162398] N80-10598

SLIP FLOW
Measurement of phase velocities in mist flows using stagnation probes
[NUREG-CR-0648] N80-10409

SLOT ANTENNAS
Theory of dielectric-filled edge-slot antennas
[AD-A071843] N80-10418

Theory, analysis, and design of a new type of strip-fed slot array
N80-10427

SNELLS LAW
Refraction corrections for surveying
[NASA-TM-80803] N80-10907

SNOW
Snow hydrology studies
N80-10575

SNOW COVER
Snow hydrology studies
N80-10575

SOCIAL FACTORS
Satellite Power System [SPS] preliminary societal assessment
[HCP/R4024-01/14] N80-10637

Socioeconomic data requirements for environmental assessment: Coal gasification and liquefaction projects
[CONF-790843-5] N80-10693

SODIUM
Analysis of the response of a thermal barrier coating to sodium and vanadium doped combustion gases
[NASA-TM-79205] N80-10344

Novel duplex vapor: Electrochemical method for silicon solar cells — chemical reactor for a silicon sodium reaction system
[NASA-CR-162387] N80-10597

SODIUM COMPOUNDS
Physical properties data compilations relevant to energy storage. 3: Engineering properties of single and polycrystalline sodium beta and beta-alumina
[PB-297847/6] N80-10946

SOIL MAPPING
Color zoning in the western desert of Egypt
N80-10553

Orbital observations of sand distribution in the western desert of Egypt
N80-10554

Preliminary analysis of color variations of sand deposits in the western desert of Egypt
N80-10555

SOLAR ACTIVITY
Investigation of possible sun-weather relationships
[PB-297385/7] N80-10719

SOLAR ARRAYS
Materials testing for central receiver solar-thermal power systems
[DOE/TIC-10085] N80-10686

SOLAR CELLS
Novel duplex vapor: Electrochemical method for silicon solar cells — chemical reactor for a silicon sodium reaction system
[NASA-CR-162387] N80-10597

Analytical evaluation of a solar thermophotovoltaic [TPV] converter
[SAND-79-0504C] N80-10638

Polycrystalline thin film gallium arsenide solar cells
[PB-298168/8] N80-10675

A perspective of a workshop on stability of thin film solar cells and materials
[PB-297799/4] N80-10676

SOLAR COLLECTORS
Optimal control of distributed parameter systems for solar thermal applications
N80-10593

The 10MW[e] solar thermal central receiver pilot plant: Heliostat foundation and interface structure investigation
[SAND-78-8185] N80-10612

MDAC/Rocketdyne solar receiver: Design review
[SAND-78-8188] N80-10616

Graphical representation of TMY solar radiation availability for one- and two-axis solar collectors
[SAND-79-0418] N80-10640

SOLAR COOLING
Passive solar energy programs and plans
[GPO-36-211] N80-10599

Ocmulgee national monument visitor center solar heating and cooling system design review data
[NASA-CR-150708] N80-10601

Solar heating and cooling systems design and development
[NASA-CR-150618] N80-10602

SOLAR ENERGY
Biomass energy enhancement: A report to the President's Council on Environmental Quality — solar heat gasification
[PB-296624/0] N80-10796

Methodology for identifying materials constraints to implementation of solar energy technologies
[PNL-2711] N80-10625

State of the art of sensible heat storage for solar heat pump systems
[BNL-25909] N80-10631

Development of a high temperature solar powered water chiller. Volume 3: Phase I
[SAN-1390-1/3-VOL-3] N80-10634

Solar generation of industrial steam. Innovative research program subtask
[COO-4546-9] N80-10636

Performance monitoring of an off-peak heating and cooling system utilizing thermal storage and solar augmented heat pump
[EPRI-ER-845] N80-10642

Solar pond concepts: Old and new
[SERI/TP-35-288] N80-10663

SOLAR ENERGY CONVERSION
Materials testing for central receiver solar-thermal power systems
[DOE/TIC-10085] N80-10686

Dispersed power systems and total energy
[SAND-78-2006C] N80-10608

Safety and environmental implications DOE/Sandia Midtemperature Solar Systems Test Facility
[SAND-78-2292C] N80-10609

Solar assisted heat pump overview and summary of in-house research
[BNL-24911] N80-10624

Survey of solar thermal energy storage subsystems for thermal/electric applications
[ORNL/TM-5758] N80-10627

Selected results from the technology assessment of solar energy program
[LA-UR-79-950] N80-10637

Analytical evaluation of a solar thermophotovoltaic [TPV] converter
[SAND-79-0504C] N80-10638

Flywheel energy storage and conversion system for solar photovoltaic applications
[COO-4094-31] N80-10639

Graphical representation of TMY solar radiation availability for one- and two-axis solar collectors
[SAND-79-0418] N80-10640

Determination of the technical and economic feasibility of luminescent solar concentrators
[SAND-79-7005] N80-10650

Preliminary analysis of a total solar heating system
[COO-4546-4] N80-10653

SOLAR GENERATORS
The first small power system experiment, Phase 1: Engineering experiment no. 1 — solar thermal electric power plants
[NASA-CR-163417] N80-10596

The 10MW[e] solar thermal central receiver pilot plant: Heliostat foundation and interface structure investigation
[SAND-78-8185] N80-10612

MDAC/Rocketdyne solar receiver: Design review
[SAND-78-8188] N80-10616

SOLAR HEATING
Passive solar energy programs and plans
[GPO-36-211] N80-10599

Ocmulgee national monument visitor center solar heating and cooling system design review data
[NASA-CR-150708] N80-10601

Solar heating and cooling systems design and development
[NASA-CR-150618] N80-10602

MSFC solar heating and cooling high speed performance [Bisper] code validation
[NASA-CR-161325] N80-10604

Economic performance of passive solar heating: A parametric analysis
[LA-UR-78-2861] N80-10645

Optimal control studies of a solar heating system
[LA-UR-78-2556] N80-10646

Simple procedure for assessing thermal comfort in passive solar heated buildings
[LA-UR-79-1337] N80-10649

Analysis of a LiCl open-cycle absorption air conditioner which utilizes a packed bed for regeneration of the absorbent solution driven by solar heated air
[COO-4546-1] N80-10652

Preliminary analysis of a total solar heating system
[COO-4546-4] N80-10653

Experimental and numerical studies of liquid storage tank thermal stratification for a solar energy system
[COO-4479-2] N80-10635
Cost-effective control systems for solar heating and cooling applications
[SAN-1592-1] N80-10658
Solar energy system performance evaluation: A-Frame Industries, single family dwelling, Kaneohe, Hawaii
[SOLAR/1010-78/14] N80-10659
Optimal insulation of pipes and tanks for solar heating systems
[ALO-5319-2] N80-10660

SOLAR HOUSES
Simple procedure for assessing thermal comfort in passive solar heated buildings
[LA-UR-79-1377] N80-10649

SOLAR POWER SATELLITES
Analysis of X-band solid-state transmitters for the solar power satellite
[NASA-CR-160320] N80-10680

SOLAR RADIATION
Graphical representation of TMY solar radiation availability for one- and two-axis solar collectors
[SAND-79-0415] N80-10640

SOLAR REFLECTORS
Summary report of the Solar Reflective Materials Technology Workshop
[PNL-2763] N80-10613

SOLAR TOTAL ENERGY SYSTEMS
Dispersed power systems and total energy
[SAND-78-2006C] N80-10608
Safety and environmental implications DOE/Sandia Midtemperature Solar Systems Test Facility
[SAND-78-2292C] N80-10609
Preliminary analysis of a total solar heating system
[COO-4546-4] N80-10653

SOLAR WIND
Numerical modeling of stimulation of induced magnetosphere during interaction of solar wind with the ionosphere of Venus
[NASA-TM-79921] N80-10990

SOLID PROPELLANT COMBUSTION
self-sustained oscillatory combustion of solid rocket propellants
N80-10304
Low frequency oscillatory combustion: Experiments and results
N80-10305
Nonlinear combustion instability in solid propellant rocket motors: Influence of geometry and propellant formulation
N80-10306
The suppression of combustion instability by particulate damping in smokeless solid propellant motors
N80-10307

SOLID PROPELLANT IGNITION
Some measurements of ignition delay and heat transfer with pyrogen igniters
N80-10290

SOLID PROPELLANT ROCKET ENGINES
Technical evaluation report on the Propulsion and Energetics Panel 53rd Symposium on Solid Rocket Motor Technology
[AGARD-AR-151] N80-10280
Solid rocket motor technology
[AGARD-CP-259] N80-10281
Research in the field of solid propellant rockets: A survey
N80-10282
Solid rocket motor design automation technology
N80-10283
A simple method to estimate the influence of a small variation in the throat area on the performance of solid rockets
N80-10287
Internal ballistic problems of Helmut highly accelerated solid propellant rockets
N80-10288
Propellant igniter development problems
N80-10289
Erosive and transient burning effects on performance prediction accuracy of tactical rockets
N80-10293
Aluminum combustion under rocket motor conditions
N80-10294
Some problems of nonlinear waves in solid propellant rocket motors
N80-10301
Recent ONERA studies on combustion instabilities in solid propellant rocket motors
N80-10302
Application of combustion instability research to solid propellant rocket motor problems
N80-10303
The suppression of combustion instability by particulate damping in smokeless solid propellant motors
N80-10307
Material problems in jet vane thrust vector control systems
N80-10308
A generalized solid motor development test approach with application to IUS
N80-10314

SOLID PROPELLANTS
Nonlinear combustion instability in solid propellant rocket motors: Influence of geometry and propellant formulation
N80-10306

SOLID ROCKET BINDERS
New binder system for composite solid propellants -- carboxyl terminated polybutidiene acrylonitrile liquid copolymer
N80-10298

SOLID ROCKET PROPELLANTS
Ignition and extinction of solid propellants
N80-10284
Ignition and extinction of solid rocket propellants
N80-10285
Propellant igniter development problems
N80-10289
Composite propellant burn rate modeling
N80-10292
Combustion of aluminum in solid propellant flames
N80-10295
The role of particulate damping in the control of combustion instability by aluminum combustion
N80-10296
Gas generator propellants for air-to-air missiles
N80-10297
self-sustained oscillatory combustion of solid rocket propellants
N80-10304
Gas phase velocity measurements in solid rocket propellants by Laser Doppler anemometry
N80-10311
Pressure and velocity response function measurements by the rotating valve method
N80-10312
X-ray spectroscopy as a diagnostic tool in solid propellant combustion flows
[AD-A070796] N80-10380

SOLID STATE DEVICES
Research investigation directed toward extending the useful range of the electromagnetic spectrum
[AD-A071664] N80-10421
Electronics research in the Army
[AD-A071805] N80-10992

SOLID WASTES
Sandia Irradiator for Dried Sewage Solids
[SAND-79-0182] N80-10971

SOLIDIFICATION
An investigation of the effects of internal solidification on turbulent-flow heat transfer and pressure drop in a horizontal tube -- prediction analytic techniques for pressure reduction
N80-10456
Development of cements for high level radioactive waste fixation
[CONF-790420-10] N80-10890

SOLUBILITY
Mass transfer and liquid-liquid dispersion in agitated vessels -- mass transfer coefficients and drop size in soluble liquid-liquid interfaces after mixing
N80-10449

SONIC BOOMS
Wind-tunnel investigation of the validity of a sonic-boom-minimization concept -- Langley Unitary Plan Wind Tunnel tests for supersonic transport design
[NASA-TP-1421] N80-10182

SONIC NOZZLES
Application of the gas flow dimensionless characteristics method for experimental study of sonic nozzles
N80-10002

SORBENTS
Filters for collection of chemical aerosol and fume samples from the air
N80-10751

SOUND INTENSITY
High intensity sound research, 1961-1978
[AD-A072550] N80-10860

SOUND TRANSMISSION
Acoustic Fluctuation Workshop: Technical review, editorial summary, synopsis and papers, volume I
[AD-A072309] N80-10862

SOUND WAVES
Experimental investigation of first and second-sound shock waves in liquid helium II
N80-10451
Theory of phonon echoes in insulators -- time functions of sound waves
N80-10858
Scattering of acoustic waves by elastic and viscoelastic obstacles of arbitrary shape immersed in a fluid
[AD-A072274] N80-10861

SOUTH AMERICA
South American river morphology and hydrology
N80-10574

SOUTH CAROLINA
Design of a pilot silvicultural biomass farm at the Savannah River Plant
[HCP/T4101-01] N80-10594

SPACE FLIGHT
A method of defining the optimum level of ionizing radiation from determinate sources during space flights
N80-10770
NSSDC data listing
[NASA-TM-80349] N80-10936

SPACE FLIGHT FEEDING
Rush nuts [Cyperus esculentus] as a source of vegetable oil in a closed life support system
N80-10769

SPACE FLIGHT STRESS
USSR Report: Space Biology and Aerospace Medicine, volume 13, no. 5, 1979 -- effects of space flight stress
[JPRS-74479] N80-10752
Dietary supplements used to prevent some changes in the human body in the presence of nervous and emotional stress
N80-10758
Course of altitude caisson disease in dogs exposed to accelerations
N80-10773

SPACE HEATING [BUILDINGS]
Passive solar energy programs and plans
[GPO-36-211] N80-10599
Economic performance of passive solar heating: A preliminary analysis
[LA-UR-78-2861] N80-10645
Optimal control studies of a solar heating system
[LA-UR-78-2556] N80-10646
Simple procedure for assessing thermal comfort in passive solar heated buildings
[LA-UR-79-1377] N80-10649

SPACE MANUFACTURING
Feasibility of commercial space manufacturing, production of pharmaceuticals. Volume 1: Executive summary
[NASA-CR-161324] N80-10266
Feasibility of commercial space manufacturing, production of pharmaceuticals. Volume 2: Technical analysis
[NASA-CR-161325] N80-10267
Feasibility of commercial space manufacturing, production of pharmaceuticals. Volume 3: Product data
[NASA-CR-161326] N80-10268

SPACE PROCESSING
Feasibility of commercial space manufacturing, production of pharmaceuticals. Volume 1: Executive summary
[NASA-CR-161324] N80-10266
Feasibility of commercial space manufacturing, production of pharmaceuticals. Volume 2: Technical analysis
[NASA-CR-161325] N80-10267
Feasibility of commercial space manufacturing, production of pharmaceuticals. Volume 3: Product data
[NASA-CR-161326] N80-10268
Alloys obtained in a state of weightlessness
N80-10270

SPACE SHUTTLE ORBITERS
Shuttle orbiter Ku-band radar/communications system design evaluation: High gain antenna/wideBeam horn
[NASA-CR-160316] N80-10275
Shuttle orbiter radar cross-sectional analysis
[NASA-TM-72870] N80-10276
Extended duration orbiter study: CO2 removal and water recovery
[NASA-CR-160317] N80-10800

SPACE SHUTTLE PAYLOADS
Launch Vehicles -- for the gps satellites
N80-10176

SPACE SHUTTLES
Oversight: Space shuttle cost, performance, and schedule review
[GPO-30-363] N80-10274
Implications of possible shuttle charging -- prediction analysis techniques for insulation and electrical grounding against ionospheric conductivity
[NASA-CR-161283] N80-10277
An experimental investigation to determine the effect of window cooling by mass injection for the Shuttle Infrared Leeside Temperature Sensing [SILTS] experiment
[NASA-TM-80170] N80-10458

SPACE TRANSPORTATION SYSTEM FLIGHTS
Shuttle orbiter radar cross-sectional analysis
[NASA-TM-72870] N80-10276

SPACEBORNE PHOTOGRAPHY
Riachao Ring, Brazil: A possible meteorite crater discovered by the Apollo astronauts
N80-10552
Color zoning in the western desert of Egypt
N80-10553
Orbital observations of sand distribution in the western desert of Egypt
N80-10554
Preliminary analysis of color variations of sand deposits in the western desert of Egypt
N80-10555

Temporal changes as depicted on orbital photographs of arid regions in North Africa
N80-10536

ASTP photographs of southeastern Angola
N80-10537

Determining photograph locations over oceans
N80-10541

Interpreting ASTP photographs of the ocean and locating the area photographed, case study of the Gulf of Mexico
N80-10562

Analysis of water color as seen in orbital and aerial photographs of Cape Cod, Nantucket, and Martha's Vineyard, Massachusetts
N80-10567

Estimate of total reflectance from the Orinoco River outflow — from Apollo Soyuz Test Project photographs
N80-10569

Observations of internal-wave surface signatures in ASTP photographs
N80-10570

Use of Apollo-Soyuz photographs in coastal studies
N80-10573

Comparison of astronaut visual color observations with ASTP photographs
N80-10577

Film exposure calculations
N80-10579

Photogrammetric analysis of ASTP earth observations experiment data
N80-10581

SPACECRAFT CHARGING

Propulsive nozzle electrification
N80-10049

Implications of possible shuttle charging — prediction analysis techniques for insulation and electrical grounding against ionospheric conductivity
[NASA-CR-161283] N80-10277

SPACECRAFT COMMUNICATION

The deep space network
[NASA-CR-162414] N80-10240

SPACECRAFT ENVIRONMENTS

The effect of dynamic factors of space flight on animal organisms
[NASA-TM-75692] N80-10745

SPACECRAFT LAUNCHING

Launch Vehicles — for the gps satellites
N80-10176

SPACECRAFT MOTION

Study of periodic motions of a satellite with a magnetic damper
[NASA-TM-79667] N80-10273

SPACECRAFT POWER SUPPLIES

Brayton isotope power system, phase I
[TID-28927] N80-10615

SPACECRAFT STRUCTURES

Use of computer structural programs for the dynamic analysis of satellites structures
[AGARD-R-680] N80-10532

SPACECRAFT TRACKING

The deep space network
[NASA-CR-162414] N80-10240

Network functions and facilities
N80-10241

Voyager support
N80-10242

Pioneer 11 saturn encounter support
N80-10243

SPACELAB

Spacelab payload accommodation handbook. Appendix B: *Structure interface definition module*
[NASA-TM-80008] N80-10272

SPACELAB PAYLOADS

Spacelab payload accommodation handbook. Appendix B: *Structure interface definition module*
[NASA-TM-80008] N80-10272

SPAIN

Phototectonic analysis of southeastern Spain from *ASTP photographs and LANDSAT images* — identification of folds, faults, and lineaments
N80-10548

East-West pervasive lineaments in central and southeastern Spain
N80-10549

SPARK CHAMBERS

Experimental study of the vidicon system for information recording using the wide-gap spark chamber of gamma - telescope gamma-1
[NASA-TM-75644] N80-10478

SPECIFIC HEAT

Electronic specific heats in metal-hydrogen systems
[CONF-790301-11] N80-10954

SPECIFIC IMPULSE

Solid propellant specific impulse prediction
N80-10286

SPECTRAL SENSITIVITY

ASTP photographic film processing and sensitometric summary
N80-10580

SPECTRAL SIGNATURES

Spectral radiometric measurement and analysis program. Volume 2: Description of the data collection program
[AD-A072079] N80-10731

SPECTROMETERS

Heat of vaporization spectrometer
[BNL-24973] N80-10480

Noise considerations in millimeter-wave spectrometers
[LBL-7296] N80-10483

SPECTRORADIOMETERS

Self-study manual on optical radiation measurements Part 1: Concepts. Chapters 7: The relative spectral responsivity and slit-scattering function of a spectroradiometer. Chapter 8: Deconvolution. Chapter 9: Physically defining measurement-beam geometry by using opaque barriers.
[PB-296067/4] N80-10740

SPECTROSCOPIC ANALYSIS

Quantitative spectroscopic studies of boron oxides and fluorides
[AD-A070997] N80-10332

SPECTRUM ANALYSIS

Spectral analysis of surface irregularities and vibrations of "spid" system elements during burnishing operations
N80-10056

Time series analysis by the maximum entropy method
[ORNL-5332] N80-10950

SPEECH RECOGNITION

Speech illusions and significance thereof to aerospace practice
N80-10736

SPHERES

Semi-empirical method for determining local heat transfer coefficients for flow around a sphere — effects of conductive heat transfer on subsonic flow distribution
N80-10084

SPHERICAL WAVES

The spherical wave phase difference temporal power spectra for light beams degraded by a turbulent atmosphere
N80-10098

SPRAY CHARACTERISTICS

Evaluation of a locally homogeneous flow model of spray evaporation
N80-10433

Spray nozzle designs for agricultural aviation applications — relation of drop size to spray characteristics and nozzle efficiency
[NASA-CR-159702] N80-10460

SPRAY NOZZLES

Spray nozzle designs for agricultural aviation applications — relation of drop size to spray characteristics and nozzle efficiency
[NASA-CR-159702] N80-10460

SPUTTERING

Stresses in sputter deposited Nickel and Copper *oxide thin films*
[SAND-79-0045C] N80-10351

STABILITY

A perspective of a workshop on stability of thin film *solar cells and materials*
[PB-297396/4] N80-10676

STAGNATION FLOW

Gas curtains in gas turbine engines
N80-10063

STAGNATION POINT

Measurement of phase velocities in mist flows using stagnation probes
[NUREG-CR-0648] N80-10469

STAINLESS STEELS

Fatigue crack propagation in high alloy and corrosion resistant [stainless] steel plate, bar and forgings
[ESDU-79003] N80-10341

The effect of environmental variables on the stress corrosion cracking behavior of type 304 stainless steel in high temperature water environments
N80-10342

Tensile properties of type 316 stainless steel irradiated in a simulated fusion reactor environment
[CONF-790125-50] N80-10355

Heat of vaporization spectrometer
[BNL-24973] N80-10480

Stainless steel blanket concept for tokamaks
[WFPS-TME-79-010] N80-10919

STANDARDS

Demonstration of remote clock monitoring by VLBI, with three baseline closure
N80-10247

Dimensions/NBS. Volume 63, Number 3, March 1979 — standards for nondestructive tests
[PB-296733/9] N80-10405

The calibration of a roundness standard
[PB-297708/0] N80-10406

Standards system in Canada, the UK, West Germany, and Denmark: An overview
[PB-296912/9] N80-10407

Thermal and lighting efficiency standards
[PB-297429/3] N80-10408

STANDING WAVES

Computer calculations of traveling-wave periodic structure properties
[SLAC-PUB-2295] N80-10423

STARS

Near infrared photographic sky survey. 1: Catalog of red stellar objects
[NASA-CR-162386] N80-10978

STARS [MATHEMATICS]

Stellar convection 2: A multi-mode numerical solution for convection in spheres
[NASA-CR-162252] N80-10979

Stellar convection 3: Convection at large Rayleigh numbers
[NASA-CR-162253] N80-10980

STATIC ELECTRICITY

Propulsive nozzle electrification
N80-10049

STATISTICAL ANALYSIS

An improvement in Fourier transform accuracy — statistical analysis of fourier transformation algorithms when seeking a single frequency
N80-10261

The scatter of mechanical values of carbon fiber composites and its causes — statistical values of strength
[NASA-TM-75698] N80-10317

A variation on Scheffe's theorm with application to nonparametric density estimation
[AD-A072132] N80-10850

STATISTICAL CORRELATION

The development of the ATC selection battery: A new procedure to make maximum use of available information when correcting correlations for restriction in range due to selection
[AD-A066132] N80-10788

STATISTICAL TESTS

Limit distributions of Kolmogorov-Smirnov type statistics under a fixed alternative with estimated location and scale parameters
[AD-A072159] N80-10847

STATOR BLADES

Experimental study of the gasdynamic characteristics of a stator cascade with cooling air discharge through the vane surface
N80-10089

On axial turbine stage rotor blade twist with tangential tilt of the stator vanes
N80-10086

STEADY FLOW

Properties of steady, viscosity stratified flow to a line sink — prediction analysis techniques for velocity distribution
N80-10455

One-dimensional model of vapor generation in steady flashing flow
[BNL-NUREG-25616] N80-10468

STEADY STATE

Multiple steady states of the oxidation of carbon monoxide on a supported platinum catalyst
N80-10327

STEAM TURBINES

Steam turbines — thermoelectric power generation
[ANL/CES/TE-78-7] N80-10502

Screening evaluation of novel power cycles integrated with gasification plants
[EPRI-AF-1002] N80-10605

STEELS

Fracture characteristics of structural steels, reference manual
[AD-A072054] N80-10349

Fatigue and corrosion fatigue of HY-80 steel, as applicable to anchor bolt failures
[AD-A072067] N80-10350

Creep behavior of Hastelloy X, 21/4 Cr-1 Mo steel, and other alloys in simulated HTGR helium
[ORNL/TM-6822] N80-10357

Nonlinear inelastic stability of flexibly-connected plane steel frames
N80-10508

STELLAR EVOLUTION

Hydrodynamics of primordial black hole formation
[NASA-TM-75918] N80-10983

STELLAR LUMINOSITY

Near infrared photographic sky survey. 1: Catalog of red stellar objects
[NASA-CR-162386] N80-10978

STELLAR STRUCTURE

Stellar convection 2: A multi-mode numerical solution for convection in spheres
[NASA-CR-162252] N80-10979

Stellar convection 3: Convection at large Rayleigh numbers
[NASA-CR-162253] N80-10980

STEP FUNCTIONS

Flying qualities research for highly augmented aircraft
[RE-382] N80-10194

STEREOPHOTOGRAPHY

Study of a stereo electro-optical tracker system for the measurement of model deformations at the national transonic facility
[NASA-CR-159146] N80-10476

Photogrammetric analysis of ASTP earth observations experiment data
N80-10581

STIFFNESS

On thin-wall beam effective stiffness
N80-10057

STOCHASTIC PROCESSES

Maximum likelihood identification of linear discrete stochastic systems — estimating and parameter identification in stochastic processes
[AD-A072147] N80-10229

The design of an optimal observer for linear discrete time dynamical systems — designing airsdar tracking system
[AD-A072066] N80-10422
Sensitivity analysis of optimal linear random parameter systems
[AD-A071091] N80-10963
STOICHIOMETRY
Effects of stoichiometry and neutron irradiation in superconducting A-15 compounds
[BNL-25940] N80-10944
STORAGE
Sodium storage and injection system
[NASA-CASE-NPO-14384-1] N80-10494
STORAGE BATTERIES
Lithium batteries: Citations from the Engineering Index data base
[NTIS/PS-79/0676/1] N80-10666
Lithium batteries. Volume 3: Citations from the NTIS data base
[NTIS/PS-79/0675/3] N80-10672
Lead batteries, volume 1. Citations from the engineering index data base
[NTIS/PS-79/0781/9] N80-10680
Lead batteries. Citations from the NTIS data base
[NTIS/PS-79/0780/1] N80-10682
Energy storage systems for automobile propulsion, 1978 study. I: Overview and findings
[UCRL-52553-VOL-1] N80-10970
STORAGE RINGS (PARTICLE ACCELERATORS)
Impact of storage rings on elementary particle physics
[LBL-8908] N80-10889
Experimental review of beam polarization in high energy positron electron storage rings
[SLAC-PUB-2258] N80-10896
STORAGE STABILITY
Storage stability of Kraton-bonded HMX-based explosives
[LA-UR-78-2730] N80-10381
STORAGE TANKS
Experimental and numerical studies of liquid storage tank thermal stratification for a solar energy system
[COO-4479-2] N80-10655
STRAIN GAGES
Determination of strain fields near concentrators from strain gage indicators
N80-10054
High-temperature strain instrumentation feasibility study
[AD-A072443] N80-10479
STRAITS
Maltese Front and Strait of Sicily ocean pattern analysis
N80-10565
STRATIFICATION
Influence of pumped storage flows on thermal stratification in reservoirs
[PB-297131/5] N80-10592
STRATIFIED FLOW
Studies on the mixing in a density-stratified shear flow
N80-10454
Properties of steady, viscosity stratified flow to a line sink — prediction analysis techniques for velocity distribution
N80-10455
STRATOSPHERE
Stratospheric H2O — atmospheric circulation models
[UCRL-82542] N80-10717
STRESS (PHYSIOLOGY)
Plasma volume changes in fit men and women during a humid heat stress before and after an acclimation
N80-10781
Effect of a rapid 4 percent carboxyhemoglobin saturation increase on maximal treadmill exercise
[PB-296627/3] N80-10786
STRESS (PSYCHOLOGY)
Dietary supplements used to prevent some changes in the human body in the presence of nervous and emotional stress
N80-10758
Life stress, self-preoccupation, and social supports
[AD-A068624] N80-10789
STRESS ANALYSIS
Illustrations of two simple methods of determining stress intensity factors from stress concentrations and stress distributions
[AD-A072199] N80-10521
Contact stress analysis of ceramic-to-metal interfaces
[AD-A072073] N80-10522
Stress analysis of cylindrical pressure vessels with closely spaced nozzles by the finite-element method. Volume 3: Vessels with three nozzles under internal pressure and external loadings
[NUREG-CR-0507-VOL-3] N80-10527
Mathematical analysis of stress cracks volume 2. A bibliography with abstracts
[NTIS/PS-79/0803/1] N80-10530
Mathematical analysis of stress cracks, volume 3. A bibliography with abstracts
[NTIS/PS-79/0804/9] N80-10531
Variation of seismic source parameters and stress drop within a descending slab as revealed from body-wave pulse-width and amplitude analysis, part 1. A seismological investigation of the subduction mechanism of aseismic ridges, part 2
N80-10710
Temperature deformations of the mirror of a radio telescope antenna
[NASA-TM-75639] N80-10908
STRESS CONCENTRATION
Determination of strain fields near concentrators from strain gage indicators
N80-10054
Illustrations of two simple methods of determining stress intensity factors from stress concentrations and stress distributions
[AD-A072199] N80-10521
STRESS CORROSION
Fatigue and corrosion fatigue of HY-80 steel, as applicable to anchor bolt failures
[AD-A072067] N80-10370
STRESS CORROSION CRACKING
The effect of environmental variables on the stress corrosion cracking behavior of type 304 stainless steel in high temperature water environments
N80-10342
STRESS MEASUREMENT
Stresses in sputter deposited Nickel and Copper oxide thin films
[SAND-79-8043C] N80-10331
STRESS WAVES
Material response to 500 keV proton beams at intensities below 1 GW/cm2
[AD-A072416] N80-10520
STRESS-STRAIN DIAGRAMS
Stress-strain diagram approximation
N80-10035
STRESS-STRAIN RELATIONSHIPS
User's guide: SPAR processor MN analysis of inelastic three-dimensional solids, part 2
[NASA-CR-161321] N80-10514
STRESS-STRAIN-TIME RELATIONS
Viscoplastic finite element analysis of steady-state forming processes including strain history and stress flux dependence
[SAND-77-1663C] N80-10538
STRIP TRANSMISSION LINES
Theory, analysis, and design of a new type of stripfed slot array
N80-10427
Strip transmission lines, volume 2. Citations from the NTIS data base — bibliography with abstracts
[NTIS/PS-79/0618/3] N80-10445
Strip transmission lines. Volume 3: Citations from the engineering index data base
[NTIS/PS-79/0620/9] N80-10446
Strip transmission lines. Volume 2: Citations from the engineering index data base
N80-10447
STRUCTURAL ANALYSIS
Structural analysis of variable-sweep wings
N80-10053
Analyses of plates constructed of fiber-reinforced bimodulus composite materials
[AD-A071377] N80-10320
Finite-element analysis of laminated composite-material plates
[AD-A071390] N80-10321
Recent research in composite and sandwich plate dynamics
[AD-A072277] N80-10322
Effect of time dependent flight loads on F19D-7 performance deterioration
[NASA-CR-159681] N80-10515
The application of thermal and creep effects to the combined isotropic-kinematic hardening model for inelastic structural analysis by the finite element method
[AD-A072153] N80-10525
Use of computer structural programs for the dynamic analysis of satellites structures
[AGARD-R-680] N80-10532
Some techniques for reducing the tower shadow of the DOE/NASA mod-0 wind turbine tower — wind tunnel tests to measure effects of tower structure on wind velocity
[NASA-TM-79302] N80-10594
STRUCTURAL BASINS
Photogeologic analysis of ASTP photographs of the Lake Torrens-Flinders Ranges-Lake Blanche area, South Australia — identification of folds, faults, and lineaments
N80-10550
STRUCTURAL DESIGN
Considerations of some critical ejector problems — for the V/STOL aircraft
N80-10127
Use of wagner functions in airfoil design optimization
[AD-A072634] N80-10139
Spacelab payload accommodation handbook. Appendix B: Structure interface definition module
[NASA-TM-80808] N80-10272
The 10MW[e] solar thermal central receiver pilot plant: Heliostat foundation and interface structure investigation
[SAND-78-8180] N80-10612
STRUCTURAL DESIGN CRITERIA
Theory of realizability for linearly elastic trusses-structures and related applications in optimum structural design
N80-10509
MDAC/Rocketdyne solar receiver: Design review
[SAND-78-8188] N80-10616
STRUCTURAL ENGINEERING
Systematization of simple detail parts of rigidible nozzle of gas turbine engine
N80-10071
Coannular supersonic ejector nozzles
N80-10128
Density and reliability predictions for a general logic structure for custom LSI
N80-10250
A low velocity water tunnel for biological research
N80-10271
Battery Energy Storage Test (BEST) facility
[EPRI-EM-1005] N80-10628
Development and testing of a three-stage double tandem accelerator-decelerator system for low energy, highly stripped ions
[COO-4257-3] N80-10678
STRUCTURAL MEMBERS
Statistical optimization of structural thermal protection material thickness
N80-10015
Structural analysis of variable-sweep wings
N80-10053
STRUCTURAL PROPERTIES (GEOLOGY)
Structural pattern of the northern part of the eastern desert of Egypt
N80-10545
Photolineaments in the ASTP stereostrip of the western desert of Egypt
N80-10546
Utilization of ASTP photographs in the study of small structures in Abu Rawash and Wadi el Natrun, Egypt
N80-10547
Phototectonic analysis of southeastern Spain from ASTP photographs and LANDSAT images — identification of folds, faults, and lineaments
N80-10548
East-West pervasive lineaments in central and southeastern Spain
N80-10549
Photogeologic analysis of ASTP photographs of the Lake Torrens-Flinders Ranges-Lake Blanche area, South Australia — identification of folds, faults, and lineaments
N80-10550
Computer software to calculate and map geologic parameters required in estimating coal production costs
[EPRI-EA-674] N80-10584
Source and propagation effects of Rayleigh waves from central Asian earthquakes — and the geological structure of New England
[AD-A070241] N80-10714
STRUCTURAL STABILITY
On the empennage snap-through problem
N80-10047
Nonlinear inelastic stability of flexibly-connected plane steel frames
N80-10508
STRUCTURAL STRAIN
Development of silicon nitride of improved toughness
[NASA-CR-159676] N80-10519
STRUCTURAL VIBRATION
Spectral analysis of surface irregularities and vibrations of "spid" system elements during burnishing operations
N80-10056
Vibration frequencies of an arch model under various loading conditions
[PB-297987/0] N80-10529
STYRENES
Compound oxidized styrylphosphine — flame resistant vinyl polymers
[NASA-CASE-MSC-14983-2] N80-10338
SUBMARINES
Minisubs for deep-sea exploration
N80-10999
SUBMERGING
Use of short-arm centrifuge to prevent deconditioning when immersed in water [according to H-reflex]
N80-10772
SUBROUTINES
Analysis techniques for use with the extended SDM model
[AD-A071647] N80-10008
SUBSONIC FLOW
On the influence of relative pitch in the subsonic turbine cascade
N80-10014
Semi-empirical method for determining local heat transfer coefficients for flow around a sphere — ef-

facts of conductive heat transfer on subsonic flow distribution
N80-10084
Entrainment characteristics of unsteady subsonic jets — for V/STOL aircraft
N80-10124

SUBSONIC SPEED
Effect of winglets on a first-generation jet transport wing. 6: Stability characteristics for a full-span model at subsonic speeds — conducted in Langley 8 foot transonic pressure tunnel
[NASA-TP-1330] N80-10101
Estimation of attainable leading-edge thrust for wings at subsonic and supersonic speeds
[NASA-TP-1500] N80-10105

SUBSTRUCTURES
System for detecting substructure microfractures and method therefore
[NASA-CASE-NPO-14192-1] N80-10307

SUGAR CANE
Sugar crops as a source of fuels. Volume 1: Agricultural research
[TID-29408/1] N80-10395

SUITS
Evaluation of heat flow components from heater to skin in an electric thermal suit
N80-11080

SULFUR
Fluidized-bed combustion of high sulfur coals
[METC/RI-79/6] N80-10386

SULFUR DIOXIDES
Likelihood estimations of vegetative alteration near known or perceived sources of air pollution
[COO-4697-1] N80-10890

SULFUR FLUORIDES
Multiple photon process in SF_6
N80-10485

SUNLIGHT
Studies on the photodegradation of poly [methyl methacrylate]
[PB-297793/2] N80-10371

SUPERCAVITATING FLOW
Leading edge flutter of a supercavitating hydrofoil
N80-10403

SUPERCONDUCTING POWER TRANSMISSION
The 50kA flux pump for the superconducting transmission line test bed
[LA-8953-MS] N80-10443

SUPERCONDUCTIVITY
AC superconducting cables
[BNL-26016] N80-10441
Magnetic and superconducting transitions in the rare earth rhodium boride compounds
N80-10927
Electron-dislocation interaction at low temperatures — metal crystals and superconductivity
[COO-2305-6] N80-10943

SUPERCONDUCTORS
Program for the development of a superconducting generator, phase 2 and 3
[AD-A072093] N80-10439
Effects of stoichiometry and neutron irradiation in superconducting A-15 compounds
[BNL-25940] N80-10944

SUPERFLUIDITY
An attempt to produce both thick and thinned flowing superfluid films. 1: A study of the feasibility of verifying Lifshitz's theory of Van der Waals force for a metallic surface. 2: The electrohydrodynamic instability of the super-thick helium film
N80-10932

SUPERHIGH FREQUENCIES
Radio frequency performance of DSS 14 64-m antenna at X-band using a dual hybrid mode feed
N80-10258
S-band ultralow-noise traveling-wave maser — study of superhigh frequency traveling wave masers and its noise temperature
N80-10260
X-band ranging by the occultation data assembly
N80-10264
Shuttle orbiter Ku-band radar/communications system design evaluation: High gain antenna/wideboam horn
[NASA-CR-160316] N80-10275
Analysis of S-band solid-state transmitters for the solar power satellite
[NASA-CR-160320] N80-10600

SUPERSONIC AIRCRAFT
Integration of ejectors into high-speed aircraft — forebody effects
N80-10119
Airblast vulnerability envelopes for supersonic aerospace vehicles
[AD-A072247] N80-10201

SUPERSONIC COMBUSTION RAMJET ENGINES
Hypersonic propulsion — supersonic combustion ramjet engines
N80-10217

SUPERSONIC COMMERCIAL AIR TRANSPORT
Supersonic propulsion technology — variable cycle engines
N80-10216

SUPERSONIC CRUISE AIRCRAFT RESEARCH
Low-speed wind-tunnel tests of a 1/10-scale model of an advanced arrow-wing supersonic cruise configuration designed for cruise at Mach 2.2 — Langley Full Scale Wind Tunnel
[NASA-TM-80152] N80-10135
Experimental evaluation of a low emissions high performance duct burner for Variable Cycle Engines (VCE) — supersonic cruise aircraft research
[NASA-CR-159694] N80-10221

SUPERSONIC FLOW
Analog modeling in studying supersonic flow around a wing and its governing analog-criteria
N80-10038
Application factor of two-dimensional transverse sonic jet interacting with supersonic stream — study of amplification factor of two dimensional jet in supersonic flow and turbulent boundary layer
N80-10042
Coannular supersonic ejector nozzles
N80-10128
Investigation of the boundary condition at a wind tunnel test section wall for a lifting wing-body model at low supersonic speed
[AD-A072096] N80-10143

SUPERSONIC JET FLOW
A two-dimensional model of the interaction of a transverse jet in a supersonic stream with application to supersonic combustion
N80-10128

SUPERSONIC SPEEDS
Estimation of attainable leading-edge thrust for wings at subsonic and supersonic speeds
[NASA-TP-1500] N80-10105

SUPERSONIC TRANSPORTS
Wind-tunnel investigation of the validity of a sonic-boom-minimization concept — Langley Unitary Plan Wind Tunnel tests for supersonic transport design
[NASA-TP-1421] N80-10102
VSCE technology definition study
[NASA-CR-159730] N80-10222

SUPERSONIC TURBINES
VSCE technology definition study
[NASA-CR-159730] N80-10222

SURFACE COOLING
An experimental investigation to determine the effect of window cooling by mass injection for the Shuttle Infrared Leeside Temperature Sensing [SILTS] experiment
[NASA-TM-80170] N80-10458

SURFACE DEFECTS
The effect of point contact surface damage on the work hardening of copper crystals
N80-10339

SURFACE FINISHING
Electrochemical copper coatings for surface finishing of hf resonators
[LA-TR-79-10] N80-10352

SURFACE NAVIGATION
Integrated Tactical Navigation Systems [ITNS] — performance tests of navigation aids for rangefinding for air and surface navigation
N80-10182

SURFACE PROPERTIES
Studies of chemical and mechanical surface phenomena by particle emission techniques
N80-10933
Results and interpretation of measurements of the light flux in the near-surface layer of the Venusian atmosphere
[NASA-TM-75716] N80-10988

SURFACE REACTIONS
Spectral analysis of surface irregularities and vibrations of 'spid' system elements during burnishing operations
N80-10856
Fracture mechanics and surface chemistry studies of fatigue crack growth in an aluminum alloy
[AD-A071438] N80-10519
Alpha transport and blistering in tokamaks
[SAND-78-8684] N80-10916
Atom-surface interactions derived from scattering data
N80-10925
Studies of chemical and mechanical surface phenomena by particle emission techniques
N80-10933

SURFACE ROUGHNESS
A literature search and review of the dynamics of aircraft-surface interaction
[AD-A070940] N80-10199

SURFACE WAVES
Interaction of surface waves with thin nickel films
N80-10931

SURFACES
The turbulent boundary layer on a curvilinear surface
N80-10030

SURVEYS
Refraction corrections for surveying
[NASA-TM-80003] N80-10997

SUSPENSION SYSTEMS [VEHICLES]
Antenna azimuth bearing model experiment
N80-10257

SWEEP FREQUENCY
Swept frequency scattering measurements of aircraft — target identification
[AD-A071474] N80-10420

SWEPT FORWARD WINGS
Study of the feasibility aspects of flight testing an aeroelastically tailored forward swept research wing on a BQM-34F drone vehicle
[NASA-CR-159149] N80-10195

SWEPT WINGS
Selecting the geometric parameters and position of a nose flap on the root profile of a swept wing using tunnel test data, part 2
N80-10044

SWIRLING
Generalized heat and mass transfer law for internal flows
N80-10073

SYMMETRY
Structure solution methods for superstructures
[CONF-790342-1] N80-10943

SYNCHRONISM
Communication network synchronization in the presence of noise
N80-10411

SYNTHETIC ARRAYS
Coded aperture imaging: A comparison between Fresnel zone apertures and uniformly redundant array apertures
[SAND-78-1625] N80-10481

SYNTHETIC FIBERS
Electrical charging of fabric and film materials
N80-10048

SYNTHETIC FUELS
Molten salt pyrolysis of latex — for hydrocarbon fuel production
[NASA-CASE-NPO-14315-1] N80-10361
Coal conversion processes and analysis methodologies for synthetic fuels production — technology assessment and economic analysis of reactor design for coal gasification
[NASA-CR-161322] N80-10379
Assessment of synfuel transportation to year 2000
[PNL-2768] N80-10382
Sugar crops as a source of fuels. Volume 1: Agricultural research
[TID-29408/1] N80-10395
Biomass energy enhancement: A report to the President's Council on Environmental Quality — solar heat gasification
[PB-296634/8] N80-10396
Energy and economic assessment of anaerobic digesters and biofuels for rural waste management
[PB-296323/4] N80-10398
Waste utilization as an energy source. Citations from the International Aerospace Abstracts Data Base
[NTIS/PS-79/0765/2] N80-10667
One- and two-dimensional heating analyses of fusion synfuel blankets
[BNL-NUREG-29635] N80-10922

SYNTHETIC RUBBERS
Development of mathematical models to describe the wear process in viscoelastic materials
N80-10496

SYSTEMS ANALYSIS
Launch Vehicles — for the gps satellites
N80-10176
The NOCC radio science subsystem: System performance validation for the DSN radio science and Very Long Baseline Interferometry [VLBI] systems
N80-10252
Standards system in Canada, the UK, West Germany, and Denmark: An overview
[PB-296912/9] N80-10407

SYSTEMS ENGINEERING
Analytic design of complex systems, II
N80-10016
Parachute-rocket deceleration system design
N80-10029
Command and control terminals — systems engineering of command and control terminals for pulse communication navigation aids
N80-10185
An/URQ-28 JTIDS class 2 tactical terminal — systems engineering of time division multiple access and TACAN signal processing for pulse communication navigation aids
N80-10186
Integration developments
N80-10188
Distributed TDMA: An approach to JTIDS phase 2
N80-10189
JTIDS II/DTDMA tactical terminal
N80-10191
Multivariable digital control systems
[AD-A071662] N80-10226
Manned engineering flight simulation validation, Part 1. Simulation requirements and simulator motion system performance
[AD-A071394] N80-10235
Shuttle orbiter Ku-band radar/communications system design evaluation: High gain antenna/wideboam horn
[NASA-CR-160316] N80-10275

Design and evaluation of decentralized filters for large scale interconnected systems — systems engineering of electric and electronic filters for electronic equipment
N80-10425
Frequency-domain approaches to linear multivariable control systems design — control theory and mathematical models for linear frequency control systems
N80-10432
Analysis of a LiCl open-cycle absorption air conditioner which utilizes a packed bed for regeneration of the absorbent solution driven by solar heated air [COO-4546-1] N80-10432
Stainless steel blanket concept for tokamaks [WFPS-TME-79-010] N80-10919
SYSTEMS MANAGEMENT
The application of an additive-ultimate model to the evaluation of transportation system management strategies
N80-10966

T

TACAN
Performance enhancement of the GPS receiver by data-free operation
N80-10172
Integration of GPS with inertial navigation systems
N80-10173
JTIDS: The issue of frequency selection — low frequency assignment for pulse communication navigation aids
N80-10183
An/URQ-28 JTIDS class 2 tactical terminal — systems engineering of time division multiple access and TACAN signal processing for pulse communication navigation aids
N80-10186
Simulator for air-to-air combat motion system investigation [AD-A072612] N80-10237
TAKEOFF RUNS
A literature search and review of the dynamics of aircraft-surface interaction [AD-A070940] N80-10199
TANKS (CONTAINERS)
Optimal insulation of pipes and tanks for solar heating systems [ALO-5319-2] N80-10660
TARGET ACQUISITION
Visual observations over oceans
N80-10563
Visual search performance in simulated remotely piloted vehicle utilization as a function of auxiliary task loading on the observer [AD-A072402] N80-10804
TARGET RECOGNITION
Swept frequency scattering measurements of aircraft — target identification [AD-A071474] N80-10420
TAXONOMY
Two important directions of development of Soviet biometry
N80-10997
TECHNOLOGICAL FORECASTING
Cargo Logistics Airlift Systems Study (CLASS). Volume 4: Future requirements of dedicated freighter aircraft to year 2000 [NASA-CR-158950-VOL-4] N80-10149
TECHNOLOGY ASSESSMENT
Advanced missile technology. A review of technology improvement areas for cruise missiles — including missile design, missile configurations, and aerodynamic characteristics [NASA-CR-3187] N80-10103
Recent developments in ejector technology in the Air Force: An overview
N80-10108
An overview of current Navy programs to develop thrust augmenting ejectors
N80-10110
Radio navigation systems: Current status
N80-10135
Turbomachinery technology
N80-10212
Control technology
N80-10215
VSCE technology definition study [NASA-CR-159730] N80-10222
Projected state-of-the-art for frequency standards for the DSN in the 1982 - 1990 time frame
N80-10248
Solid rocket motor technology [AGARD-CP-259] N80-10281
Research in the field of solid propellant rockets: A survey
N80-10282
Composites in future motor hardware: A research view
N80-10309
Coal conversion processes and analysis methodologies for synthetic fuels production — technology assessment and economic analysis of reactor design for coal gasification [NASA-CR-161322] N80-10379
Assessment of synfuel transportation to year 2000 [PNL-2768] N80-10382
Survey of liquid hydrogen container techniques for highway vehicle fuel system applications [HCP/M2752-01] N80-10383
Research guidance studies to assess gasoline from coal by methanol-to-gasoline and naxol-type Fischer-Tropsch technologies [FE-2447-13] N80-10388
Coal conversion systems: Technical data book [HCP/T2286-01] N80-10392
Applications survey: evaluation of gas turbine needs [EPRI-AF-911] N80-10498
Summary report of the Solar Reflective Materials Technology Workshop [PNL-2763] N80-10613
Environmental data for energy technology policy analysis. Volume 1: Summary [HCP/EV6119-1] N80-10629
Environmental readiness of emerging energy technologies [DOE/ERD-0022] N80-10631
Selected results from the technology assessment of solar energy program [LA-UR-79-950] N80-10637
State-of-the-art survey of joinability of materials for OTEC heat exchangers [ORNL/TM-6284] N80-10647
State of the art of sensible heat storage for solar heat pump systems [BNL-25909] N80-10651
Proceedings of AESOP-SCIE symposium on advanced computing [CONF-781061-P2] N80-10846
Subgroup report on alternative technology strategies for the isolation of nuclear waste [TID-28818] N80-10905
Energy storage systems for automobile propulsion, 1978 study. 1: Overview and findings [UCRL-52553-VOL-1] N80-10970
TECHNOLOGY TRANSFER
NASA Tech Briefs Index, 1978 — bibliography [NASA-SP-5021[20]] N80-10967
NASA Tech Briefs Index, 1977, volume 2, numbers 1-4 [NASA-SP-5021[19]] N80-10968
TECHNOLOGY UTILIZATION
Civil applications of NAVSTAR GPS
N80-10175
Instrumentation technology
N80-10214
LANDSAT project, State of Hawaii: A preliminary report [PB-296712/3] N80-10587
Passive solar energy programs and plans [GPO-36-211] N80-10799
The requirements and feasibility of business planning in the office of space and terrestrial applications [NASA-CR-162388] N80-10852
A study of the cost-effective markets for new technology agricultural aircraft [NASA-CR-159090] N80-10962
Cumulative index to NASA Tech Briefs, 1970-1975 — bibliographies [NASA-SP-5021[18]] N80-10969
TECTONICS
Marsh fault zone and the opening of the Red Sea
N80-10541
Phototectonic analysis of southeastern Spain from ASTP photographs and LANDSAT images — identification of folds, faults, and lineaments
N80-10548
The 1978 symposium on the Rio Grande Rift. Program and abstracts [LA-7487-C] N80-10716
TEETERING
A flight investigation of performance and loads for a helicopter with NLR-1T main-rotor blade sections [NASA-TM-80165] N80-10136
TEMPERATURE CONTROL
Heat pipe thermal control of slender optics probes [LA-UR-78-3169] N80-10467
Optimal control studies of a solar heating system [LA-UR-78-2556] N80-10648
TEMPERATURE DEPENDENCE
Transients in vibrational relaxation of polyatomic molecules at high temperatures by the variable encounter method [AD-A070774] N80-10867
Measurements of thermal conductivity of bcc Fe-3 at very low temperatures
N80-10929
Physical properties data compilations relevant to energy storage. 3: Engineering properties of single and polycrystalline sodium beta and beta-alumina [PB-297847/6] N80-10946
TEMPERATURE DISTRIBUTION
Use of the method of variable directions for numerical study of the temperature states of a turbine disk with blades — temperature distribution of rotating disk turbine blades using linear transformation
N80-10028
Study of homogeneous combustion chamber temperature field nonuniformity with primary zone parameter variation — of fuel-air parameters
N80-10065
Computer calculation of stationary temperature fields in air-cooled turbine rotor blades
N80-10067
Computer calculation of stationary temperature fields in cooled turbine discs
N80-10069
Warmup of LRE chambers with regenerative cooling
N80-10087
Numerical simulation of dual-media thermal energy storage systems — fluid and solid temperature distributions [SAND-78-2282C] N80-10642
Experimental and numerical studies of liquid storage tank thermal stratification for a solar energy system [COO-4479-2] N80-10655
TEMPERATURE EFFECTS
Reactions of rats to overheating following prolonged hypokinesia
N80-10761
Temperature deformations of the mirror of a radio telescope antenna [NASA-TM-75633] N80-10908
TEMPERATURE GRADIENTS
Application of gradient method to study of heat transfer in axisymmetric channels of different configuration
N80-10080
Nonstationarity of heat transfer in axial turbine blading during engine startup
N80-10089
TEMPERATURE MEASUREMENT
Fundamentals of heat measurement — heat flux transducers [NASA-TM-75490] N80-10459
Equilibrium temperatures in self-contained bearing assemblies. Part 2: First approximation to temperature rise [ESDU-78027] N80-10495
TEMPERATURE PROFILES
On the structure of the upper atmosphere of Mars according to data from experiments on the Viking space vehicles [NASA-TM-75717] N80-10989
TEMPERATURE SENSORS
An experimental investigation to determine the effect of window cooling by mass injection for the Shuttle Infrared Losside Temperature Sensing (SILTS) experiment [NASA-TM-80178] N80-10458
TENSILE PROPERTIES
Tensile properties of type 316 stainless steel irradiated in a simulated fusion reactor environment [CONF-790125-50] N80-10355
TENSILE STRENGTH
The ageing behaviour of solid rocket propellants regarding their mechanical properties
N80-10299
TERRAIN ANALYSIS
Temporal changes as depicted on orbital photographs of arid regions in North Africa
N80-10536
ASTP photographs of southeastern Angola
N80-10537
TARADCOM signal analysis program — user manual [AD-A072014] N80-10817
TEST EQUIPMENT
A simple apparatus for the experimental study of non-steady flow thrust-augmenter ejector configurations
N80-10125
The 50kA flux pump for the superconducting transmission line test bed [LA-6953-MS] N80-10443
TEST STANDS
A portable stand for assessing the dynamics of a working individual's functional state — based on a microprocessor
N80-10730
TESTING TIME
The effect of the duration of jet aircraft flyover sounds on judged annoyance — noise predictions and noise measurements of jet aircrafts and human reactions to the noise intensity [NASA-CR-159132] N80-10839
THEOREM PROVING
On the consistency of the maximum likelyhood estimate of normal mixture parameters for a sample with field structure [NASA-CR-160352] N80-10836
Mixing conditions and limit theorems for maxima of some stationary sequences [COO-2874-38] N80-10844

THEOREMS
Lyapunov stability and its application to systems of ordinary differential equations
[NASA-TM-88806] N88-10835
THEORETICAL PHYSICS
Mechanisms of proton stability and decay in unified models
[LA-UR-79-361] N88-10675
New particles, theoretical
[LBL-7977] N88-10887
Asymptotic freedom without guilt — quantum chromodynamics and quark confinement
[UH-511-329-79] N88-10952
THERMAL BATTERIES
Studies of the abnormally high peak voltage observed with FeS2 depolarized thermal batteries
[SAND-79-0896] N88-10641
THERMAL COMFORT
Simple procedure for assessing thermal comfort in passive solar heated buildings
[LA-UR-79-1337] N88-10649
THERMAL CONDUCTIVITY
Thermal conduction effects in human skin. Phase 2: Experimental validation and application of data in selection of materials
[AD-A060480] N88-10783
Measurements of thermal conductivity of bcc He-3 at very low temperatures
N88-10929
Thermal conductivity of the helium-argon system — prediction analysis techniques for thermal conductivity of argon helium gas mixtures
[ANL-79-3] N88-10953
THERMAL CONTROL COATINGS
Self-similar solutions in the destruction and melting problem with account for abrupt density change — heat transfer problems for composite thermoprotective coatings
N88-10841
THERMAL ENERGY
Conceptual design of thermal energy storage systems for near-term electric utility applications. Volume 2: Appendixes, screening of concepts
[NASA-CR-159411] N88-10622
THERMAL EXPANSION
Transient phenomena in thermal explosion of confined gases
N88-10373
THERMAL INSULATION
Statistical optimization of structural thermal protective material thickness
N88-10015
Economic performance of passive solar heating: A preliminary analysis
[LA-UR-78-3861] N88-10645
Experimental and numerical studies of liquid storage tank thermal stratification for a solar energy system
[COO-4479-2] N88-10655
Optimal insulation of pipes and tanks for solar heating systems
[ALO-5319-2] N88-10660
THERMAL MAPPING
A thermal vegetation canopy model of sensor response
N88-10535
THERMAL NOISE
DSS receiver thermal noise model comparisons
N88-10262
THERMAL PROTECTION
Statistical optimization of structural thermal protection material thickness
N88-10015
Self-similar solutions in the destruction and melting problem with account for abrupt density change — heat transfer problems for composite thermoprotective coatings
N88-10841
Analysis of the response of a thermal barrier coating to sodium and vanadium doped combustion gases
[NASA-TM-79205] N88-10344
An experimental investigation to determine the effect of window cooling by mass injection for the Shuttle Infrared Leeside Temperature Sensing [SILTS] experiment
[NASA-TM-80179] N88-10458
THERMAL STABILITY
Flammability and thermal stability of polyphosphazenes copolymers, part 1
[AD-A072114] N88-10366
THERMOCHEMISTRY
Hydrogen production. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0773/6] N88-10401
Solar generation of industrial steam. Innovative research program outreach
[COO-4546-9] N88-10656
THERMOCOUPLES
High temperature tungsten-rhenium thermocouples with molybdenum-rhenium sheaths
[TFBP-TR-285] N88-10482
THERMODYNAMIC EFFICIENCY
Development of combustion data to utilize low Btu gases as industrial process fuels. Project 61004 special report no. 4: High-forward-momentum burner
[FE-2409-33] N88-10390
Thermal and lighting efficiency standards
[PB-297429/3] N88-10408
Screening evaluation of novel power cycles integrated with gasification plants
[EPRI-AF-1002] N88-10685
Sensitivity study of Brayton cycle power plant performance
[SAND-78-8028] N88-10626
Economic performance of passive solar heating: A preliminary analysis
[LA-UR-78-3861] N88-10645
THERMODYNAMIC PROPERTIES
Dynamics of diesel fuel combustion in turbulent flow
N88-10074
Combustion of aluminum in solid propellant flames
N88-10295
Improving the all weather ballistic and mechanical properties of smokeless propergols
N88-10300
Physics of mesomorphic compounds — cholesteric liquid crystal
[AD-A070539] N88-10935
Physical properties data compilations relevant to energy storage. 3: Engineering properties of single and polycrystalline sodium beta and beta-alumina
[PB-297847/8] N88-10946
Thermodynamics of precipitation systems — thermodynamic properties of precipitation hardening in binary systems
[ORNL-5537] N88-10955
THERMODYNAMICS
Parametric method of aircraft engine status diagnostics based on limited information
N88-10003
Thermodynamics of precipitation systems — thermodynamic properties of precipitation hardening in binary systems
[ORNL-5537] N88-10955
THERMOGRAVIMETRY
Thermogravimetric analysis of polymers in air
[AD-A070669] N88-10365
THERMOREGULATION
Reactions of rats to overheating following prolonged hypokinesia
N88-10761
THETA PINCH
Numerical experiments on the theta pinch
[NASA-TM-75094] N88-10915
THICK FILMS
The noise properties of thick film resistors
N88-10428
An attempt to produce both thick and thinned flowing superfluid films. 1: A study of the feasibility of verifying Lifshitz's theory of Van der Waals force for a metallic surface. 2: The electrohydrodynamic instability of the super-thick helium film
N88-10932
THICKNESS RATIO
Electrical measurement of plating thickness
[BDX-613-1942-REV] N88-10442
THIN AIRFOILS
Prediction of aerodynamic forces on a circular cylinder and thin airfoil in a transonic airstream by the finite element method
N88-10093
Internal-external flow integration for a thin ejector-flapped wing section
N88-10113
THIN FILMS
The development of Antiguard, a clear, water displacing, corrosion preventive compound
[AD-A071617] N88-10347
Stresses in sputter deposited Nickel and Copper oxide thin films
[SAND-79-0045C] N88-10351
Polycrystalline thin film gallium arsenide solar cells
[PB-298168/6] N88-10675
A perspective of a workshop on stability of thin film solar cells and materials
[PB-297396/4] N88-10676
Interaction of surface waves with thin nickel films
N88-10931
An attempt to produce both thick and thinned flowing superfluid films. 1: A study of the feasibility of verifying Lifshitz's theory of Van der Waals force for a metallic surface. 2: The electrohydrodynamic instability of the super-thick helium film
N88-10932
THIN WALLS
Analysis of thin-wall beams by the method of segments
N88-10043
On thin-wall beam effective stiffness
N88-10057
THREE DIMENSIONAL FLOW
Numerical prediction of 3-D ejector flows
N88-10111
A computational model for three-dimensional incompressible wall jets with large cross flow
N88-10115
Pressure and velocity measurements in a three-dimensional wall jet
N88-10126
An efficient user-oriented method for calculating compressible flow in an about three-dimensional inlets — panel method
[NASA-CR-159578] N88-10134
THRUST
Estimation of attainable leading-edge thrust for wings at subsonic and supersonic speeds
[NASA-TP-1500] N88-10185
THRUST AUGMENTATION
Characteristics of afterburning bypass turbojet engine with oxygen injection into the afterburner chamber — study of fuel injection into thrust chambers for thrust augmentation
N88-10029
Workshop on Thrust Augmenting Ejectors
[NASA-CP-2093] N88-10107
Recent developments in ejector technology in the Air Force: An overview
N88-10108
NASA overview
N88-10109
An overview of current Navy programs to develop thrust augmenting ejectors
N88-10110
Vinci&lviscid interaction analysis of thrust augmenting ejectors
N88-10112
Computer aided design study of hypermixing nozzles
N88-10116
Nonsteady-flow thrust augmenting ejectors
N88-10117
Some tests on small-scale rectangular thrust ejector — thrust augmentation for V/STOL aircraft
N88-10120
Augmenting ejector endwall effects — V/STOL aircraft
N88-10121
An investigation of corner separation within a thrust augmenter having Coanda jets
[NADC-76153-30] N88-10122
Entrainment characteristics of unsteady subsonic jets — for V/STOL aircraft
N88-10124
A simple apparatus for the experimental study of non-steady flow thrust-augmenter ejector configurations
N88-10125
Pressure and velocity measurements in a three-dimensional wall jet
N88-10126
Considerations of some critical ejector problems — for the V/STOL aircraft
N88-10127
Coannular supersonic ejector nozzles
N88-10128
Reaction control system augmentation for V/STOL aircraft
N88-10130
Design and test of a prototype scale ejector wing
N88-10131
The external augmentor concept for V/STOL aircraft
N88-10132
The XFV-12A Thrust-Augmented Wing (TAW) prototype aircraft
N88-10133
THRUST CHAMBERS
Characteristics of afterburning bypass turbojet engine with oxygen injection into the afterburner chamber — study of fuel injection into thrust chambers for thrust augmentation
N88-10029
Warmup of LRE chambers with regenerative cooling
N88-10087
THRUST CONTROL
Reaction control system augmentation for V/STOL aircraft
N88-10130
THRUST MEASUREMENT
Measurement of thrust transients in rocket motors
N88-10316
THRUST VECTOR CONTROL
Mathematical model and stability of hydraulic servo drive with jet-throttle regulation
N88-10033
Material problems in jet vane thrust vector control systems
N88-10308
TIME DEPENDENCE
Linearized unsteady jet analysis
N88-10118
Method of lines approach to the numerical solution of conservation laws — time dependent solutions of hyperbolic partial differential equations
[LA-UR-79-837] N88-10841
Time-dependent Hartree-Fock phase: Unique implication of variational principle
[ORO-5126-58] N88-10842
TIME DIVISION MULTIPLE ACCESS
Command and control terminals — systems engineering of command and control terminals for pulse communication navigation aids
N88-10185

An/URQ-28 JTIDS class 2 tactical terminal — systems engineering of time division multiple access and TACAN signal processing for pulse communication navigation aids
N80-10186
Distributed TDMA: An approach to JTIDS phase 2
N80-10189
The 30/20 GHz mixed user architecture development study
[NASA-CR-159686] N80-10415
The 30/20 GHz mixed user architecture development study: Executive summary
[NASA-CR-159687] N80-10416

TIME DIVISION MULTIPLEXING
JTIDS II/DTDMA - command and control terminals
N80-10190

TIME FUNCTIONS
Theory of phonon echoes in insulators — time functions of sound waves
N80-10858
The spherical wave phase difference temporal power spectra for light beams degraded by a turbulent atmosphere
N80-10898

TIME LAG
An experimental investigation of the effects of antenna pointing errors on range delays — error analysis of range errors in directional antennas due to time lag
N80-10259
Some measurements of ignition delay and heat transfer with pyrogen igniters
N80-10290

TIME MEASUREMENT
GPS time
N80-10162

TIME SERIES ANALYSIS
Method of time series modelling, parameter and state estimation of nonlinear systems — for real time Naval combat weapon systems
N80-10853
Time series analysis by the maximum entropy method
[ORNL-5332] N80-10950

TIRES
Transient aspect of hydroplaning: Hydroplaning phenomenon during sudden changes in the fluid layer on a pavement — effect of fluid films on tires on a highway
N80-10448
Development of mathematical models to describe the wear process in viscoelastic materials
N80-10456

TISSUES [BIOLOGY]
Effect of space flight conditions on deoxyribonucleoprotein and nucleic acid content of rat tissues
N80-10760

TITAN
Saturn's magnetosphere, rings, and inner satellites
[U-OF-IOWA-79-44] N80-10987

TITANIUM
Dependence of fracture toughness of molybdenum laser welds on dendritic spacing and in situ titanium additions
[SAND-79-0193C] N80-10301

TITANIUM ALLOYS
Determination of constitutive equations for high strength Aluminum and Titanium alloys applicable to sheet metal formability
[AD-A072121] N80-10346

TOKAMAK DEVICES
Alpha transport and blistering in tokamaks
[SAND-78-8684] N80-10916
Power supply requirements for a tokamak fusion reactor
[ANL/FPP/TM-119] N80-10918
Stainless steel blanket concept for tokamaks
[WFPS-TME-79-010] N80-10919
Study of a tokamak cleaning method utilizing glow discharge
[ORNL-TR-4664] N80-10921
Fast magnetosonic wave heating of the NUWMAK tokamak reactor
[UWFDM-227] N80-10923

TOMOGRAPHY
X-ray tomography by optical reconstruction from projections
N80-10985

TOOLING
Improvements in remote equipment torquing and fastening
[CONF-781105-64] N80-10499

TOPOLOGY
Non-rectangular mos field effect devices — topology gatefield effect transistors are studied
N80-10429

TOROIDAL PLASMAS
Transient eddy currents on finite plane and toroidal conducting surfaces
[PPPL-1517] N80-10444

TORQUE
Measurement of liquid pump torque in the starting regime
N80-10066

TORSION
Investigation of the T sub 2 [T sub g] relaxation of homopolymers and block copolymers of styrene by torsional braid analysis
[AD-A072075] N80-10363

TOWERS
Some techniques for reducing the tower shadow of the DOE/NASA mod-0 wind turbine tower — wind tunnel tests to measure effects of tower structure on wind velocity
[NASA-TM-79202] N80-10594

TOXIC HAZARDS
Toxic effects of chemicals in the altered gas environment of pressurized chambers
N80-10775

TOXICITY
National library of medicine toxicology data base management system
[ORNL/CSD/TM-80] N80-10785
Dimensions/NIH, volume 43, no. 6, June 1979
[PB-297836/9] N80-10975

TOXICOLOGY
National library of medicine toxicology data base management system
[ORNL/CSD/TM-80] N80-10785
Analysis of airborne particulates and human urine by inductively coupled plasma-atomic emission spectrometry
[PB-297775/9] N80-10787

TRACE ELEMENTS
Evaluation of atmospheric trace constituent sensors operating from remote space and airborne platforms
[NASA-CR-162365] N80-10711
Analysis of airborne particulates and human urine by inductively coupled plasma-atomic emission spectrometry
[PB-297775/9] N80-10787

TRACKING [POSITION]
Long-term tracking of artic icebergs
[AD-A072473] N80-10583

TRACKING NETWORKS
Study of a stereo electro-optical tracker system for the measurement of model deformations at the national transonic facility
[NASA-CR-159146] N80-10476

TRAILING-EDGE FLAPS
Pressure and velocity measurements in a three-dimensional wall jet
N80-10126

TRAJECTORY OPTIMIZATION
Navigation and meteorological error equations for some aerodynamic parameters
[NASA-TM-80804] N80-10150

TRANSDUCERS
Fundamentals of heat measurement — heat flux transducers
[NASA-TM-75498] N80-10459

TRANSFER FUNCTIONS
Issues in the digital implementation of control compensators
[NASA-CR-162416] N80-10814

TRANSFORMATIONS [MATHEMATICS]
A Reed-Solomon decding program for correcting both errors and erasures
N80-10234
General relativistic gravitation as the theory of broken symmetry of intransitive groups of transformations
[SLAC-PUB-2167] N80-10856

TRANSIENT RESPONSE
Transient phenomena in thermal explosion of confined gases
N80-10373

TRANSISTOR AMPLIFIERS
Analysis of S-band solid-state transmitters for the solar power satellite
[NASA-CR-160320] N80-10600

TRANSIT SATELLITES
Transit: The current satellite navigation system
N80-10136

TRANSITION TEMPERATURE
Ductility in bending of molybdenum alloys irradiated between 425 and 1000C
[CONF-790125-53] N80-10354
Investigation of the T sub 2 [T sub g] relaxation of homopolymers and block copolymers of styrene by torsional braid analysis
[AD-A072075] N80-10363
Effects of stoichiometry and neutron irradiation in superconducting A-15 compounds
[BNL-25940] N80-10944

TRANSMISSION EFFICIENCY
Radio frequency performance of DSS 14 64-m antenna at X-band using a dual hybrid mode feed
N80-10258

TRANSMITTER RECEIVERS
Minimum cost transmitter-receiver antenna pairs — antenna design for the satellite solar power station using optimal control theory
[RM-690] N80-10414

TRANSONIC FLOW
Two-dimensional flow past convex and concave corners at transonic speed and two-dimensional flow around a parabolic nose at subsonic and transonic speeds
N80-10092
Prediction of aerodynamic forces on a circular cylinder and thin airfoil in a transonic airstream by the finite element method
N80-10093
The Martin-Lomax iteration for the computations of transonic flow fields: Some observations
[AD-A072523] N80-10141
Acceleration of transonic potentials flow calculations on arbitrary meshes by the multigrid grid method
[AD-A072301] N80-10542

TRANSPARENCE
Lexicon of aircraft transparency terms
[AD-A071319] N80-10280
The development of Antiguard, a clear, water displacing, corrosion preventive compound
[AD-A071617] N80-10347

TRANSPORT AIRCRAFT
Effect of winglets on a first-generation jet transport wing. 6: Stability characteristics for a full-span model at subsonic speeds — conducted in Langley 8 foot transonic pressure tunnel
[NASA-TP-1330] N80-10101
Factors affecting the retirement of commercial transport jet aircraft
[NASA-CR-152300] N80-10148

TRANSPORT PROPERTIES
Models for the migration of paraffinic additives in polyethylene
[PB-297671/0] N80-10372
One- and two-dimensional heating analyses of fusion synfuel blankets
[BNL-NUREG-25639] N80-10922
An ac large signal model for the GaAs MESFET
[AD-A071663] N80-10936
Electron-dislocation interaction at low temperatures — metal crystals and superconductivity
[COO-2305-6] N80-10943

TRANSPORT THEORY
Mathematical models of the process of vibrosubsive grinding of parts with autonomous vibrations in the vibromachine container
N80-10823

TRANSPORTATION
Assessment of synfuel transportation to year 2000
[PNL-2768] N80-10382
Survey of liquid hydrogen container techniques for highway vehicle fuel system applications
[HCP/M2752-01] N80-10383
Modeling the impacts of transportation systems management on vehicle emissions, phase 1
[PB-296908/7] N80-10697

TRAVELING SALESMAN PROBLEM
A restricted lagrangean approach to the traveling salesman problem
[AD-A072457] N80-10837

TRAVELING WAVE MASERS
S-band ultralow-noise traveling-wave maser — study of superhigh frequency traveling wave masers and its noise temperature
N80-10260

TRAVELING WAVE TUBES
A point design for a gyrotron traveling wave tube amplifier
N80-10246

TRAVELING WAVES
Computer calculations of traveling-wave periodic structure properties
[SLAC-PUB-2295] N80-10423

TREES [MATHEMATICS]
Strip trees: A hierarchical representation for map features
[AD-A071124] N80-10582

TRIANGULATION
Photogrammetric analysis of ASTP earth observations experiment data
N80-10581

TRIAXIAL STRESSES
High-temperature strain instrumentation feasibility study
[AD-A072443] N80-10479

TROPICAL REGIONS
ASTP at Barbados: Mesoscale pools of Amazon River water in the western tropical Atlantic
N80-10568

TROPOSPHERE
Coagulation rates of sub-micron particulates in the troposphere
[PB-293756/1] N80-10695
Evaluation of atmospheric trace constituent sensors operating from remote space and airborne platforms
[NASA-CR-162365] N80-10711
Investigation of possible sun-weather relationships
[PB-297385/7] N80-10719

TRUSSES
Theory of realizability for linearly elastic truss-structures and related applications in optimum structural design
N80-10509

TU-154 AIRCRAFT
Pneumatic distributor for turbojet engine control system — TU-154 aircraft
N80-10091

TUNGSTATES
Growth of bismuth tungstate single crystals — hydrothermal crystal growth of single crystals
[COO-1198-1261] N80-10940

TURBINE BLADES
Experimental study of curvilinear surface film cooling effectiveness — film cooling of curvature flat surface turbine blades
N80-10026

Long-life GTE operation based on technical condition — fatigue and service life monitoring of turbine blades in aircraft engines
N80-10027

Use of the method of variable directions for numerical study of the temperature states of a turbine disk with blades — temperature distribution of rotating disk turbine blades using linear transformation
N80-10028

Computer calculation of stationary temperature fields in air-cooled turbine rotor blades
N80-10067

Experimental investigation of annular cascade performance
[AD-A072042] N80-10064

TURBINE ENGINES
Aeropropulsion 1979 — conferences
[NASA-CP-2092] N80-10205

Materials and structures technology
N80-10210

Turbomachinery technology
N80-10212

Mechanical components
N80-10213

Mechanism of turbine engine lubricant deposition
[AD-A072557] N80-10223

TURBINE PUMPS
On stability of operation of Liquid Rocket Engine with Turbopump Assembly [TPA]
N80-10034

TURBINE WHEELS
Centripetal turbine fabrication technology
N80-10078

TURBINES
Soviet aeronautics, volume 21, no. 3 — gas dynamics, flow characteristics, axial flow turbines, and gas turbine engines
N80-10001

On the influence of relative pitch in the subsonic turbine cascade
N80-10014

Computer calculation of stationary temperature fields in cooled turbine discs
N80-10069

Method for calculating optimal parameters of high-pressure pneumatic drives
N80-10070

Improving the stress rupture and creep of silicon nitride — turbine materials
[NASA-CR-159585] N80-10318

Some techniques for reducing the tower shadow of the DOE/NASA mod-0 wind turbine tower — wind tunnel tests to measure effects of tower structure on wind velocity
[NASA-TM-79202] N80-10594

TURBOFAN ENGINES
Experimental evaluation of a low emissions high performance duct burner for Variable Cycle Engines [VCE] — supersonic cruise aircraft research
[NASA-CR-159694] N80-10221

TURBOGENERATORS
The first small power system experiment, Phase 1: Engineering experiment no. 1 — solar thermal electric power plants
[NASA-CR-162417] N80-10596

TURBOJET ENGINES
Parametric method of aircraft engine status diagnostics based on limited information
N80-10003

Characteristics of afterburning bypass turbojet engine with oxygen injection into the afterburner chamber — study of fuel injection into thrust chambers for thrust augmentation
N80-10029

Pneumatic distributor for turbojet engine control system — TU-154 aircraft
N80-10091

TURBOMACHINE BLADES
On the influence of relative pitch in the subsonic turbine cascade
N80-10014

TURBOMACHINERY
Turbomachinery technology
N80-10212

TURBULENCE EFFECTS
The spherical wave phase difference temporal power spectra for light beams degraded by a turbulent atmosphere
N80-10896

TURBULENT BOUNDARY LAYER
Experimental study of turbulence energy balance components in the section of a retarded turbulent boundary layer
N80-10019

The turbulent boundary layer on a curvilinear surface
N80-10020

Application factor of two-dimensional transverse sonic jet interacting with supersonic stream — study of amplification factor of two-dimensional jet in supersonic flow and turbulent boundary layer
N80-10082

Some measurements in synthetic turbulent boundary layers — over flat plates in turbulent and laminar flow
N80-10095

An experimental investigation of forced mixing of a turbulent boundary layer in an annular diffuser — turbulent mixing in annular flow mixers and vortex generators
N80-10096

Prediction of unsteady turbulent boundary layers with flow reversal
[AD-A072548] N80-10465

TURBULENT DIFFUSION
Flow on magnetizable particles in turbulent air streams
[NASA-CR-162418] N80-10461

TURBULENT FLOW
Heat transfer in turbulent gas flows with high-frequency pressure oscillations
N80-10064

Dynamics of diesel fuel combustion in turbulent flow
N80-10074

Some measurements in synthetic turbulent boundary layers — over flat plates in turbulent and laminar flow
N80-10095

Numerical prediction of 3-D ejector flows
N80-10111

An investigation of the effects of internal solidification on turbulent-flow heat transfer and pressure drop in a horizontal tube — prediction analysis techniques for pressure reduction
N80-10436

Flow on magnetizable particles in turbulent air streams
[NASA-CR-162418] N80-10461

TURBULENT JETS
Large-scale turbulent structures in jets and in flows over cavities and their relationship to entrainment and mixing
N80-10123

TURBULENT MIXING
An experimental investigation of forced mixing of a turbulent boundary layer in an annular diffuser — turbulent mixing in annular flow mixers and vortex generators
N80-10096

Viscid/inviscid interaction analysis of thrust augmenting ejectors
N80-10112

Computer aided design study of hypermixing nozzles
N80-10116

Considerations of some critical ejector problems — for the V/STOL aircraft
N80-10127

Studies on the mixing in a density-stratified shear flow
N80-10434

TURBULENT WAKES
Experimental study of the turbulent wake downstream of a fan jet
N80-10018

TURKEY
Analysis and synthesis of space imagery of the southeastern-Turkey/northwestern-Iran mobile belt
N80-10544

TWISTING
On axial turbine stage rotor blade twist with tangential tilt of the stator vanes
N80-10086

TWO BODY PROBLEM
Lyapunov stability and its application to systems of ordinary differential equations
[NASA-TM-80806] N80-10035

TWO DIMENSIONAL BODIES
AGARD two-dimensional aeroelastic configurations
[AGARD-AR-156] N80-10302

TWO DIMENSIONAL FLOW
Two-dimensional flow past convex and concave corners at transonic speed and two-dimensional flow around a parabolic nose at subsonic and transonic speeds
N80-10092

Calculation of optimal coordinates for two-dimensional incompressible flow
N80-10094

Viscid/inviscid interaction analysis of thrust augmenting ejectors
N80-10112

VNAP: A computer program for computation of two-dimensional, time-dependent compressible, viscous, internal flow
[LA-7326] N80-10470

TWO DIMENSIONAL JETS
Application factor of two-dimensional transverse sonic jet interacting with supersonic stream — study of amplification factor of two dimensional jet in supersonic flow and turbulent boundary layer
N80-10082

TWO PHASE FLOW
One-dimensional model of vapor generation in steady flashing flow
[BNL-NUREG-25616] N80-10468

TYPHOONS
Typhoon report, 1978
[AD-A070904] N80-10732

U

U.S.S.R.
Soviet aeronautics, volume 21, no. 3 — gas dynamics, flow characteristics, axial flow turbines, and gas turbine engines
N80-10001

Soviet energy balances
[RAND/R-2257-DOE] N80-10634

Two important directions of development of Soviet biometry
N80-10997

U.S.S.R. SPACE PROGRAM
Geophysics, astronomy and space, no. 432
[JPRS-74125] N80-10269

ULTRAHIGH FREQUENCIES
Analysis of S-band solid-state transmitters for the solar power satellite
[NASA-CR-160320] N80-10600

ULTRASONIC FLAW DETECTION
Ultrasonic imaging as applied to non-destructive testing of rocket propellants
N80-10313

ULTRASONIC TESTS
Nondestructive ultrasonic testing and inspection. Volume 3: Citations from the engineering index data base
[NTIS/PS-79/0636/5] N80-10505

Nondestructive ultrasonic testing and inspection. Volume 4: Citations from the engineering index data base, April 1978 May 1979
[NTIS/PS-79/0637/3] N80-10506

ULTRAVIOLET RADIATION
Investigation into the chemistry of the UV-ozone purification process
[PB-296485/6] N80-10337

UNDERGROUND STORAGE
Risk methodology for geologic disposal of radioactive waste: The Sandia Waste Isolation Flow and Transport [SWIFT] model
[SAND-78-1267] N80-10084

UNDERGROUND TRANSMISSION LINES
Fiber optic utilization at the Nevada Test Site — radiation effects on underground cables for analog data transmission
[LA-7029-MS] N80-10912

UNDERWATER ACOUSTICS
Acoustic Fluctuation Workshop: Technical review, editorial summary, synopsis and papers, volume I
[AD-A072309] N80-10862

UNDERWATER TESTS
The effect of environmental variables on the stress corrosion cracking behavior of type 304 stainless steel in high temperature water environments
N80-10342

UNDERWATER VEHICLES
Re-establishment of laminar flow on a Heated Submerged Vehicle
[AD-A072566] N80-10463

UNITED KINGDOM
Standards system in Canada, the UK, West Germany, and Denmark: An overview
[PB-290912/9] N80-10407

UNITED STATES OF AMERICA
Another look at energy conservation
[LBL-7893] N80-10611

National energy plan 2
[DOE/TIC-10109] N80-10618

Overview of geothermal energy in the United States
[CONF-790530-1] N80-10661

UNMANNED SPACECRAFT
The deep space network
[NASA-CR-162414] N80-10240

Network functions and facilities
N80-10241

UNSTEADY FLOW
Most rational linearization of nonlinear unsteady heat conduction problems
N80-10012

Nonsteady-flow thrust augmenting ejectors
N80-10117

Linearized unsteady jet analysis
N80-10118

Entrainment characteristics of unsteady subsonic jets — for V/STOL aircraft
N80-10124

A simple apparatus for the experimental study of non-steady flow thrust-augmenter ejector configurations
N80-10125

Prediction of unsteady turbulent boundary layers with flow reversal
[AD-A072548] N80-10465

Unsteady laminar-flow separation in tubes. 2: The effect of variations in the frequency and amplitude of flow oscillations
[PB-296968/1] N80-10473

UPPER ATMOSPHERE
Geophysics, astronomy and space, no. 432
[JPRS-74125] N80-10269
The 19035D GSRS, missile number 1020, round number V-21
[AD-A070559] N80-10722
The 19304D GSRS, missile number 1023, round number V-23
[AD-A070558] N80-10723
The [FA] 19304 GSRS, missile number 1019, round number V-20
[AD-A070830] N80-10727
On the structure of the upper atmosphere of Mars according to data from experiments on the Viking space vehicles
[NASA-TM-75717] N80-10989

UPPER STAGE ROCKET ENGINES
A generalized solid motor development test approach with application to IUS
N80-10314

URANIUM ISOTOPES
The jet membrane process for uranium separation and enrichment
[RE-586] N80-10329

URBAN DEVELOPMENT
Dimensions/NBS, volume 63, no. 6, June 1979
[PB-297836/9] N80-10975

URBAN TRANSPORTATION
The application of an additive-ultimate model to the evaluation of transportation system management strategies
N80-10966

URINE
Analysis of airborne particulates and human urine by inductively coupled plasma-atomic emission spectrometry
[PB-297775/9] N80-10787

USER MANUALS [COMPUTER PROGRAMS]
Phase 2 GPS receiver design philosophy
N80-10171
User's guide: SPAR processor MN analysis of inelastic three-dimensional solids, part 2
[NASA-CR-161321] N80-10514
TARADCOM signal analysis program — user manual
[AD-A072014] N80-10817
Project Aries: Users manual for Arian 2 and associated subsystems
[AD-A072471] N80-10818
VAL: A value-oriented algorithmic language (preliminary reference manual)
[AD-A072394] N80-10826
User's guide to PLOTIN/MYPLOT. A general-purpose plotting routine for use with AMD graphics
[ANL/RER/78-3] N80-10829

USER REQUIREMENTS
Computer mapping software and geographic data base development: Oak Ridge National Laboratory user experience
[CONF-780727-1] N80-10586
Proposed research planning format for the Environmental Assessment Department — needs and concerns of groups concerned with environment and energy issues
[EPRI-EA-1018] N80-10692

V

V/STOL AIRCRAFT
Some tests on small-scale rectangular thrust ejector — thrust augmentation for V/STOL aircraft
N80-10120
Augmenting ejector endwall effects — V/STOL aircraft
N80-10121
Entrainment characteristics of unsteady subsonic jets — for V/STOL aircraft
N80-10124
Considerations of some critical ejector problems — for the V/STOL aircraft
N80-10127
Interface concerns of ejector integration in V/STOL aircraft
N80-10129
Reaction control system augmentation for V/STOL aircraft
N80-10130
The external augmentor concept for V/STOL aircraft
N80-10132

/ACUUM TESTS
Wear of modified electrical brush material in vacuum
[RAE-TRANS-2907] N80-10436

/AN DER WAAL FORCES
An attempt to produce both thick and thinned flowing superfluid films. I: A study of the feasibility of verifying Lifshitz's theory of Van der Waals force for a metallic surface. 2: The electrohydrodynamic instability of the super-thick helium film
N80-10932

VANADIUM
Analysis of the response of a thermal barrier coating to sodium and vanadium doped combustion gases
[NASA-TM-79205] N80-10344

VANELESS DIFFUSERS
Study of radial diffusers with flow swirl — profile of a vaneless diffusion in a compressible inviscid flow
N80-10025

VANES
On axial turbine stage rotor blade twist with tangential tilt of the stator vanes
N80-10086

VAPOR PHASES
Gas phase velocity measurements in solid rocket propellants by Laser Doppler anemometry
N80-10311

VAPORS
Remote sensing of LNG spill vapor dispersion using Raman LIDAR
[UCRL-13984] N80-10689

VARIABLE CYCLE ENGINES
Computational fluid mechanics of internal flow
N80-10211
Supersonic propulsion technology — variable cycle engines
N80-10216
Experimental evaluation of a low emissions high performance duct burner for Variable Cycle Engines [VCE] — supersonic cruise aircraft research
[NASA-CR-159694] N80-10221

VARIABLE SWEEP WINGS
Structural analysis of variable-sweep wings
N80-10053
Effect of several airframe/nozzle modifications on the drag of a variable-sweep bomber configuration — conducted in langley 16 foot transonic tunnel
[NASA-TM-80129] N80-10106

VARIATIONAL PRINCIPLES
Time-dependent Hartree-Fock phase: Unique implication of variational principle
[ORO-5126-58] N80-10842

VARIATIONS
Acoustic Fluctuation Workshop: Technical review, editorial summary, synopsis and papers, volume I
[AD-A072309] N80-10862

VECTOR ANALYSIS
DSN CONSCAN: A vector nomenclature and method for determining parameter values
N80-10256
Introduction to VECTRAN and its use in scientific applications programming
[LA-7491-C] N80-10830

VEGETATION
A thermal vegetation canopy model of sensor response
N80-10535
Impact of Great Lakes water level fluctuations on coastal wetlands
[PB-296483/9] N80-10590

VEGETATION GROWTH
Likelihood estimations of vegetative alteration near known or proposed sources of air pollution
[COO-4497-1] N80-10690

VEHICULAR TRACKS
Antenna azimuth bearing model experiment
N80-10257

VELOCITY DISTRIBUTION
Properties of steady, viscosity stratified flow to a line sink — prediction analysis techniques for velocity distribution
N80-10455

VELOCITY MEASUREMENT
Gas phase velocity measurements in solid rocket propellants by Laser Doppler anemometry
N80-10311
Pressure and velocity response function measurements by the rotating valve method
N80-10312

VENEZUELA
Estimate of total reflectance from the Orinoco River outflow — from Apollo Soyuz Test Project photographs
N80-10569

VENUS ATMOSPHERE
Results and interpretation of measurements of the light flux in the near-surface layer of the Venusian atmosphere
[NASA-TM-75716] N80-10988
Numerical modeling of stimulation of induced magnetosphere during interaction of solar wind with the ionosphere of Venus
[NASA-TM-75921] N80-10990

VENUS SURFACE
Results and interpretation of measurements of the light flux in the near-surface layer of the Venusian atmosphere
[NASA-TM-75716] N80-10988

VERTICAL LANDING
Vertical Takeoff and Landing [VTOL] propulsion technology
N80-10218

VERTICAL TAKEOFF AIRCRAFT
Vertical Takeoff and Landing [VTOL] propulsion technology
N80-10218

VIBRATION
Angular vibration of aircraft. Volume 1: Executive summary
[AD-A071895] N80-10197
Angular vibration of aircraft. Volume 2: Prediction methods for angular vibration
[AD-A071749] N80-10198
Coincidence of higher-order modes: A mechanism of the excitation of cylindrical shell vibrations via internal sound
N80-10510

VIBRATORY POLISHING
Mathematical models of the process of vibroabrasive grinding of parts with autonomous vibrations in the vibromachine container
N80-10023

VIDICONS
Experimental study of the vidicon system for information recording using the wide-gap spark chamber of gamma - telescope gamma-1
[NASA-TM-75644] N80-10478

VIKING SPACECRAFT
On the structure of the upper atmosphere of Mars according to data from experiments on the Viking space vehicles
[NASA-TM-75717] N80-10989

VINYL POLYMERS
Compound oxidized styrylphosphine — flame resistant vinyl polymers
[NASA-CASE-MSC-14980-2] N80-10258

VIRGINIA
Regional geochemical exploration for mineral deposits in the appalachians of central and northwestern Virginia
N80-10534
Offshore pipeline corridors and landfalls in coastal Virgina, volumes 1 and 2 and appendices
[PB-297439/2] N80-10708

VISCOELASTICITY
An incremental form of the single-integral nonlinear viscoelastic theory for elastic-plastic-creep finite element analysis
[AD-A072151] N80-10523
Scattering of acoustic waves by elastic and viscoelastic obstacles of arbitrary shape immersed in a fluid
[AD-A072274] N80-10861

VISCOPLASTICITY
Dynamic response of a slab of elastic-viscoplastic material that exhibits induced plastic anisotropy
[ISSN-0072-9310] N80-10513

VISCOUS FLOW
Vinicid/inviscid interaction analysis of thrust augmenting ejectors
N80-10112
Properties of steady, viscosity stratified flow to a line sink — prediction analysis techniques for velocity distribution
N80-10455
VNAP: A computer program for computation of two-dimensional, time-dependent compressible, viscous, internal flow
[LA-7326] N80-10470

VISIBILITY
Turbulence environment characterization
[AD-A072379] N80-10736

VISUAL DISCRIMINATION
Human vigilance investigation analysis of the pattern array test [further data analysis]
[UCRL-13891-3] N80-10798

VISUAL FLIGHT
Pilot performance during simulated approaches and landings made with various computer-generated visual glide-path indicators
[AD-A066220] N80-10151

VISUAL OBSERVATION
Visual observations over oceans
N80-10563
Ocean color observations — by astronauts
N80-10566
Comparison of astronaut visual color observations with ASTP photographs
N80-10577
Visual search performance in simulated remotely piloted vehicle utilization as a function of auxiliary task loading on the observer
[AD-A072402] N80-10804

VISUAL PERCEPTION
Use of the pupil to study the scotopic and chromatic mechanisms of vision in humans
N80-10777
Remote operator performance comparing mono and stereo TV displays: The effects of visibility, learning and task factors
[AD-A068201] N80-10793
Evoked cortical potentials and information processing
[AD-A070789] N80-10794

VITRIFICATION
Experimental joule-heated ceramic melter for converting radioactive waste to glass
[DP-MS-78-59] N80-10008
Application of microwave energy to post-calcination treatment of high-level nuclear wastes — pellet drying and glass vitrification
[SCP-1183] N80-10009
VOICE COMMUNICATION
The 30/20 GHz mixed user architecture development study
[NASA-CR-159696] N80-10015
The 30/20 GHz mixed user architecture development study: Executive summary
[NASA-CR-159697] N80-10016
Possibility of using bone conduction in aviation radio communication — cranial bone transducers
N80-10753
Speech illusions and significance thereof to aerospace practice
N80-10756
VOLCANOES
Volcanic landforms and satellites
N80-10731
VOLT-AMPERE CHARACTERISTICS
Studies of the abnormally high peak voltage observed with Fe/S2 depolarized thermal batteries
[SAND-79-0098] N80-10641
VORTEX GENERATORS
An experimental investigation of forced mixing of a turbulent boundary layer in an annular diffuser — turbulent mixing in annular flow mixers and vortex generators
N80-10096
VORTEX STREETS
Forced response of a Blasius flat-plate boundary layer to an external vortex street
[AD-A072486] N80-10462
VORTICES
Flow-around small-aspect-ratio delta wing with vortex "bursting"
N80-10060
Study of combined operation of self-evacuating vortex tube with diffuser
N80-10085
VOYAGER PROJECT
Voyager support
N80-10042

W

WALL FLOW
Motion of rectangular wing between parallel walls
N80-10050
Pressure and velocity measurements in a three-dimensional wall jet
N80-10126
Propellant driven turbulent interior ballistics and wall erosion
[UCRL-81289] N80-10279
WALL JETS
A computational model for three-dimensional incompressible wall jets with large cross flow
N80-10115
Augmenting ejector endwall effects — V/STOL aircraft
N80-10121
WALLS
Study of a tokamak cleaning method utilizing glow discharge
[ORNL-TR-4664] N80-10921
WASHINGTON
Hydrologic modeling and data requirements for analysis of urban streamflow management alternatives
[PB-296499/7] N80-10591
WASTE DISPOSAL
Quality assurance in alternative energy sources
[RHO-SA-107] N80-10704
Metabolic responses of shallow tropical benthic microcosm communities to perturbation
[PB-298243/7] N80-10744
Risk methodology for geologic disposal of radioactive waste: The Sandia Waste Isolation Flow and Transport (SWIFT) model
[SAND-78-1267] N80-10804
Subgroup report on alternative technology strategies for the isolation of nuclear waste
[TID-28818] N80-10885
WASTE ENERGY UTILIZATION
Deep space network feasibility study of terminating Southern California Edison electrical service to Goldstone — cost analysis of electric power supplies and waste energy utilization
N80-10263
Waste Heat Utilization: Proceedings of 1978 Engineering Foundation Conference
[CONF-780810] N80-10665
WASTE TREATMENT
Wastewater treatment in coal conversion
[PB-297507/8] N80-10700
Experimental joule-heated ceramic melter for converting radioactive waste to glass
[DP-MS-78-59] N80-10008
Application of microwave energy to post-calcination treatment of high-level nuclear wastes — pellet drying and glass vitrification
[SCP-1183] N80-10009
Risk analysis methodology and data: Study of alternatives for long-term management of Hanford defense high-level radioactive waste
[NSC-PE-ARH-77001] N80-10091
Immobilization of hazardous residuals by encapsulation — using a polyester matrix
[PB-296642/2] N80-10097
Sandia Irradiator for Dried Sewage Solids
[SAND-79-0182] N80-10971
Treatment of refinery wastewater using a filtration-activated carbon system
[PB-297708/1] N80-10972
Municipal Wastewater Treatment Facility, winter 1978
[PB-296813/9] N80-10974
High energy electron radiation of wastewater liquid residuals
[PB-297595/6] N80-10976
WASTE UTILIZATION
Acid digestion of combustible waste
[HEDL-TME-78-77] N80-10614
Waste utilization as an energy source. Citations from the International Aerospace Abstracts Data Base
[NTIS/PS-79/0765/2] N80-10667
WASTE WATER
Wastewater treatment in coal conversion
[PB-297507/8] N80-10700
Prepreotitype vapor compression distillation subsystem — recovering potable water from wastewater
[NASA-CR-160332] N80-10801
Treatment of refinery wastewater using a filtration-activated carbon system
[PB-297708/1] N80-10972
Municipal Wastewater Treatment Facility, winter 1978
[PB-296813/9] N80-10974
High energy electron radiation of wastewater liquid residuals
[PB-297595/6] N80-10976
Performance and upgrading of wastewater stabilization ponds — conferences
[PB-297504/3] N80-10977
WATER CIRCULATION
Some study state exact solutions of the wind-driven circulation equations for a rigid-lid shallow lake
[PB-297206/5] N80-10589
WATER COLOUR
Ocean color observations — by astronauts
N80-10566
Analysis of water color as seen in orbital and aerial photographs of Cape Cod, Nantucket, and Martha's Vineyard, Massachusetts
N80-10567
WATER FLOW
A low velocity water tunnel for biological research
N80-10271
Hydrologic modeling and data requirements for analysis of urban streamflow management alternatives
[PB-296499/7] N80-10591
WATER HEATING
Solar energy system performance evaluation: A-Frame Industries, single family dwelling, Kaneohe, Hawaii
[SOLAR/1010-78/14] N80-10639
WATER MANAGEMENT
Critical research needs in community water management
[PB-297504/3] N80-10977
WATER POLLUTION
Investigation into the chemistry of the UV-ozone purification process
[PB-296485/6] N80-10537
Analysis of method of polarization surveying of water surface oil pollution
[NASA-TM-75708] N80-10686
Charged membrane, low pressure ultrafiltration to treat acid mine drainage waters
[PB-297209/9] N80-10703
Analysis of priority pollutants at a primary aluminum production facility
[PB-297491/5] N80-10707
Metabolic responses of shallow tropical benthic microcosm communities to perturbation
[PB-298243/7] N80-10744
Dichromate oxidability as a criterion of quantitative levels of organic impurities in reclaimed water
N80-10766
WATER QUALITY
The use of satellites in environmental monitoring of coastal waters
[NASA-CR-162409] N80-10687
Performance and upgrading of wastewater stabilization ponds — conferences
[PB-297504/3] N80-10977
WATER RECLAMATION
Extended duration orbiter study: CO2 removal and water recovery
[NASA-CR-160317] N80-10800
Prepreotitype vapor compression distillation subsystem — recovering potable water from wastewater
[NASA-CR-160332] N80-10801
WATER RESOURCES
LANDSAT project, State of Hawaii: A preliminary report
[PB-296712/5] N80-10587
WATER RUNOFF
Charged membrane, low pressure ultrafiltration to treat acid mine drainage waters
[PB-297209/9] N80-10703
WATER TEMPERATURE
Influence of pumped storage flows on thermal stratification in reservoirs
[PB-297131/5] N80-10592
WATER TREATMENT
Prepreotitype vapor compression distillation subsystem — recovering potable water from wastewater
[NASA-CR-160332] N80-10801
WAVE ATTENUATION
Interaction of surface waves with thin nickel films
N80-10931
WAVE PROPAGATION
Source and propagation effects of Rayleigh waves from central Asian earthquakes — and the geological structure of New England
[AD-A078241] N80-10714
Propagation of waves in a medium with high radiation pressure
[NASA-TM-75679] N80-10982
WAVEFORMS
JTIDS signal structure
N80-10184
Command and control terminals — systems engineering of command and control terminals for pulse communication navigation aids
N80-10185
Computer calculations of traveling-wave periodic structure properties
[SLAC-PUB-2295] N80-10423
WEAPON SYSTEMS
Method of time series modelling, parameter and state estimation of nonlinear systems — for real time Naval combat weapon systems
N80-10853
WEAPONS DELIVERY
Application of GPS to low cost tactical weapons
N80-10174
WEAR
Development of mathematical models to describe the wear process in viscoelastic materials
N80-10496
WEAR INHIBITORS
Improvement of wear-resistance properties of natural aggregates by materials impregnation
[BNL-25396] N80-10323
WEAR TESTS
Design criteria for dry lubricated flight control bearings — wear tests to make design analysis and check equipment specifications
[AD-A071322] N80-10228
Wear of modified electrical brush material in vacuum
[RAE-TRANS-2007] N80-10436
WEATHER FORECASTING
Sensitivity study of CFAS and CFAR objective analysis techniques
[AD-A071452] N80-10734
Analysis of statistical parameters from satellite digital data, July 1978 GOES-west, for use in diagnosing marine fog
[AD-A072145] N80-10735
WEIGHTLESSNESS
Alloys obtained in a state of weightlessness
N80-10270
Passive propellant system
[NASA-CASE-MFS-23642-1] N80-10278
The effect of dynamic factors of space flight on animal organisms
[NASA-TM-75092] N80-10745
Current conceptions on the genesis of vestibulovegetative disorders in weightlessness
N80-10753
Use of short-arm centrifuge to prevent decompensating when immersed in water [according to H-reflex]
N80-10772
WELD STRENGTH
Dependence of fracture toughness of molybdenum laser welds on dendritic spacing and in situ titanium additions
[SAND-79-0192C] N80-10301
WELDED JOINTS
Fracture characteristics of structural steels, reference manual
[AD-A072054] N80-10349
WETLANDS
Impact of Great Lakes water level fluctuations on coastal wetlands
[PB-296403/9] N80-10590
WHISKER COMPOSITES
Metal matrix composites, volume 2: A bibliography with abstracts
[NTIS/PS-79/0680/3] N80-10324

Metal matrix composites. Volume 3: A bibliography with abstracts
[NTIS/PS-79/0681/1] N80-10325
WIND [METEOROLOGY]
Some steady state exact solutions of the wind-driven circulation equations for a rigid-lid shallow lake
[PB-297206/5] N80-10589
WIND MEASUREMENT
The 19702A GSRS, missile no. 301, round B-10
[AD-A070707] N80-10721
Lance missile no. 4388, round no. 330 ACL
[AD-A071335] N80-10733
WIND TUNNEL APPARATUS
Development of an air heater for a mixture formation test rig — heating equipment for heat generation in hypersonic wind tunnels
[RAE-TRANS-2012] N80-10232
WIND TUNNEL STABILITY TESTS
Effect of winglets on a first-generation jet transport wing. 6: Stability characteristics for a full-span model at subsonic speeds — conducted in Langley 8 foot transonic pressure tunnel
[NASA-TP-1330] N80-10101
WIND TUNNEL TESTS
Selecting the geometric parameters and position of a nose flap on the root profile of a swept wing using tunnel test data, part 2
N80-10044
Wind-tunnel investigation of the validity of a sonic-boom-minimization concept — Langley Unitary Plan Wind Tunnel tests for supersonic transport design
[NASA-TP-1421] N80-10102
Low-speed wind-tunnel tests of a 1/10-scale model of an advanced arrow-wing supersonic cruise configuration designed for cruise at Mach 2.2 — Langley Full Scale Wind Tunnel
[NASA-TM-80152] N80-10125
Cryogenic wind tunnel activities at the University of Southampton — flow visualization technique for low speed wind tunnel tests
[NASA-CR-159144] N80-10231
Some techniques for reducing the tower shadow of the DOE/NASA mod-0 wind turbine tower — wind tunnel tests to measure effects of tower structure on wind velocity
[NASA-TM-79202] N80-10794
WIND TUNNEL WALLS
Motion of rectangular wing between parallel walls
N80-10070
Investigation of the boundary condition at a wind tunnel test section wall for a lifting wing-body model at low supersonic speed
[AD-A072098] N80-10143
WIND TUNNELS
Calculation of working process in slow-compression piston-type aerodynamic tube
N80-10062
WIND VELOCITY
Some techniques for reducing the tower shadow of the DOE/NASA mod-0 wind turbine tower — wind tunnel tests to measure effects of tower structure on wind velocity
[NASA-TM-79202] N80-10794
WIND VELOCITY MEASUREMENT
Some techniques for reducing the tower shadow of the DOE/NASA mod-0 wind turbine tower — wind tunnel tests to measure effects of tower structure on wind velocity
[NASA-TM-79202] N80-10794
Evaluation of the passive remote crosswind sensor — detecting the movement of atmospheric scintillations
[AD-A071176] N80-10730
WINDOWS [APERTURES]
An experimental investigation to determine the effect of window cooling by mass injection for the Shuttle Infrared Leeside Temperature Sensing (SILTS) experiment
[NASA-TM-80170] N80-10058
WINDPOWER UTILIZATION
Methods of estimating the reliability of wind energy systems with storage
[UCRL-15005] N80-10623
Fluid dynamic aspects of wind energy conversion
[AGARD-AG-243] N80-10683
WINDPOWERED GENERATORS
Methods of estimating the reliability of wind energy systems with storage
[UCRL-15005] N80-10623
Fluid dynamic aspects of wind energy conversion
[AGARD-AG-243] N80-10683
WINDSHIELDS
Lexicon of aircraft transparency terms
[AD-A071319] N80-10200
WING FLAPS
Internal-external flow integration for a thin ejector-flapped wing section
N80-10113
WING PROFILES
Selecting the geometric parameters and position of a nose flap on the root profile of a swept wing using tunnel test data, part 2
N80-10044
Laminar boundary layer calculation from experimental pressure distribution
N80-10045
WING ROOTS
Selecting the geometric parameters and position of a nose flap on the root profile of a swept wing using tunnel test data, part 2
N80-10044
WING TIPS
The significance of wing and configuration in airfoil design for civil aviation aircraft
[NASA-TM-75711] N80-10104
WINGLETS
Effect of winglets on a first-generation jet transport wing. 6: Stability characteristics for a full-span model at subsonic speeds — conducted in Langley 8 foot transonic pressure tunnel
[NASA-TP-1330] N80-10101
WINGS
Analog modeling in studying supersonic flow around a wing and its governing analog-criteria
N80-10030
Effect of winglets on a first-generation jet transport wing. 6: Stability characteristics for a full-span model at subsonic speeds — conducted in Langley 8 foot transonic pressure tunnel
[NASA-TP-1330] N80-10101
Estimation of attainable leading-edge thrust for wings at subsonic and supersonic speeds
[NASA-TP-1500] N80-10105
Prediction of aerodynamic characteristics of fighter wings at high lift
[AD-A072630] N80-10140
A study to develop optimization algorithms for aircraft wing structures
[AD-A072668] N80-10196
WOOD
Near term potential of wood as a fuel
[HCP/C4101] N80-10389
WORDS [LANGUAGE]
Effects of retrieval term specificity on information retrieval from computer-based intelligence systems
[AD-A072312] N80-10958
WORK HARDENING
The effect of point contact surface damage on the work hardening of copper crystals
N80-10139
Dynamic response of a slab of elastic-viscoplastic material that exhibits induced plastic anisotropy
[ISSN-0072-9310] N80-10513
An investigation into the combined isotropic-kinematic workhardening rule
[AD-A072152] N80-10524

X

X RAY ANALYSIS
Roentgenological examination of the human heart after 500-day hypokinesia
N80-10759
X RAY ASTRONOMY
Algorithms for locating celestial sources of X-rays and gamma flares with the aid of onboard spacecraft
[NASA-TM-75920] N80-10991
X RAY IMAGERY
X-ray tomography by optical reconstruction from projections
N80-10905
X RAY LASERS
A study of soft X-ray laser schemes in multi-component laser plasmas — population inversions from laser plasma interactions
N80-10915
X RAY SOURCES
Emittance measurements on field emitter diodes
[UCRL-82533] N80-10440
X RAY SPECTROSCOPY
X-ray spectroscopy as a diagnostic tool in solid propellant combustion flows
[AD-A070796] N80-10380

Y

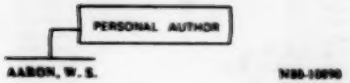
YAW
On modeling sensitivity of a linear system to reduction of its order by the infinitesimal transformation method in the yaw motion control problem
N80-10046
YAWING MOMENTS
Wing-body yawing moment and sideforce derivatives due to sideslip: Nv and Yv
[ESDU-79006] N80-10097
YEMEN
Color of desert surfaces in the Arabian peninsula
N80-10759

Z

ZIRCONIUM COMPOUNDS
Magnetic field studies of electronic Raman scattering in rare-earth zircons
N80-10930
ZIRCONIUM OXIDES
Analysis of the response of a thermal barrier coating to sodium and vanadium doped combustion gases
[NASA-TM-79205] N80-10344

PERSONAL AUTHOR INDEX

Typical Personal Author Index Listing



Listings in this Index are arranged alphabetically by personal author. The NASA accession number denotes the number by which the citation is identified.

A

AARON, W. S. N80-10890
ABALAKOV, G. V. N80-10882
ABBOTT, G. W. N80-10196
ABBOTT, J. M. N80-10218
ABDEL-RAHMAN, M. A. N80-10545
N80-10549
N80-10571
ABDRAKHMANOV, S. S. N80-10867
ABELES, T. P. N80-10398
ABIDIN, B. I. N80-10763
ABOUDI, J. N80-10513
ABOUELEZZ, M. N80-10371
ABRAMS, L. K. N80-10544
ABUAF, N. N80-10468
ACKERMAN, D. G. N80-10696
ACKERMAN, W. B. N80-10826
ACKROYD, M. H. N80-10508
ADAMCZYK, J. J. N80-10211
ADAMSON, J. J. N80-10350
ADLER, D. N80-10629
AFANASEV, V. N. N80-10019
AGLIULLIN N80-10042
AGNEW, A. B. N80-10585
AGRAWAL, S. K. N80-10448
AHRENS, T. J. N80-10857
AKHMEDYANOVA, F. A. N80-10076
AKHMEDZYANOV, A. M. N80-10003
AKIMOV, V. V. N80-10478
ALDEN, R. E. N80-10131
ALEKSANDROV, V. V. N80-10032
ALESZKA, J. N80-10349
ALEXANDER, M. N80-10803
ALFARO-BOU, E. N80-10512
ALLEN, C. N80-10614
ALLEN, C. B. N80-10643
ALLEN, D. H. N80-10524
N80-10525
ALLEN, J. E. N80-10242
ALPERIN, M. N80-10127
ALTSEIMER, J. H. N80-10637
ALVAR, K. R. N80-10873
AMOS, D. E. N80-10466
ANDERS, F. J. N80-10577
ANDERSON, B. H. N80-10211
ANDERSON, C. J. N80-10970
ANDERSON, S. M. N80-10271
ANDERSON, W. J. N80-10213
ANDREASSI, J. L. N80-10794
ANDRESEN, P. L. N80-10342
ANDREWS, E. H. N80-10368
ANDREWS, J. W. N80-10624
ANGELAKOS, D. J. N80-10438
ANTAL, M. J., JR. N80-10396
APEL, J. R. N80-10570
ARMSTRONG, G. J. N80-10929
ARNOLD, C. B. N80-10834
ASBRIDGE, J. R. N80-10984
ATKINSON, L. P. N80-10742
AUERBACH, I. N80-10144
AUGHEY, R. N80-10186
AULT, L. E. N80-10613
AVDEYEV, V. I. N80-10908
AYRES, R. P. N80-10708
AZIZ, A. K. N80-10840

B

BACA, S. N80-10795
BADGER, R. L. N80-10899
BAHYE, W. N80-10704
BAIRAMOV, F. D. N80-10834
BAJURA, R. A. N80-10592
BAKER, C. W. N80-10581
BAKER, P. C. N80-10493
BAKER, R. D. N80-10886
BAKER, V. R. N80-10574
BAKLYGIN, V. N. N80-10948
BAKULEV, V. I. N80-10024
BALAS, E. N80-10830
N80-10821
N80-10837
BALDWIN, D. N80-10816
BALLARD, D. H. N80-10382
BALOEV, A. A. N80-10035
BAME, S. J. N80-10984
BANE, K. L. N80-10423
BANSAL, N. P. N80-10643
BARATTA, F. I. N80-10521
BARBONI, R. N80-10532
BARENBERG, E. J. N80-10230
N80-10105
BARGER, R. L. N80-10479
BARKER, L. M. N80-10575
BARNES, J. C. N80-10413
BARNES, J. R. N80-10280
BARRERE, M. N80-10282
N80-10873
BARSCHALL, H. H. N80-10161
BARTHOLOMEY, C. A. N80-10192
BARTON, C. K. N80-10036
BASHKIN, V. A. N80-10658
BASSETT, W. W. N80-10517
BAUDIN, G. N80-10916
BAUER, W. N80-10518
BAULD, N. R., JR. N80-10474
BAUM, H. R. N80-10361
BAUMAN, A. J. N80-10995
BAYEVSKIY, R. N80-10878
BAYFIELD, J. E. N80-10004
BAZAROV, V. G. N80-10478
BAZER-BASHV, R. N80-10033
BAZHENOV, A. I. N80-10217
BEACH, H. L., JR. N80-10647
BEAVER, R. J. N80-10876
BECKER, R. L. N80-10838
BEEX, A. A. N80-10696
BEIMER, R. G. N80-10544
BEKEN, A. N80-10543
BELCHER, R. C. N80-10763
BELKIN, V. I. N80-10815
BELLMAN, R. N80-10608
BELOBOUBEK, E. V. N80-10005
BELOUSOV, A. I. N80-10019
BELOV, V. M. N80-10645
BEN-DAVID, S. N80-10254
BENJAUTHRIT, B. N80-10691
BENKOVITZ, C. M. N80-10892
BENNETT, R. A. N80-10498
BENNETT, R. R. N80-10862
BEREZOVSKII, A. B. N80-10970
BERGERIN, C. J. N80-10822
BERKOWITZ, B. J. N80-10252
BERMAN, A. L. N80-10889
BERRETH, J. R. N80-10741
BERRY, E. N80-10320
BERT, C. W. N80-10322
N80-10768
N80-10112
N80-10116
N80-10131
N80-10923
BESPALOVA, L. A. N80-10913
BEVILACQUA, P. M. N80-10703
N80-10698
N80-10213
N80-10128
BEYER, J. B. N80-10982
BHAGAVATULA, V. A. N80-10916
BHATTACHARYYA, D. N80-10553
BICKER, D. N80-10553
BILL, R. C. N80-10553
BISHOP, A. R. N80-10553
BISNOVATYI-KOGAN, G. S. N80-10553
BISSON, C. L. N80-10553
BIVIN, J. D. N80-10082
BIZOT, A. N80-10284
BLACK, P. G. N80-10576
BLACKFIELD, D. T. N80-10923
BLACKSTOCK, D. T. N80-10840
BLAND, S. R. N80-10202
BLENNIKOV, S. I. N80-10982
BLOOMQUIST, C. N80-10657
BLOOMSTER, C. H. N80-10625
BODNER, S. R. N80-10513
BOGOMOLOV, A. I. N80-10001
N80-10016
N80-10061
N80-10055
N80-10650
N80-10914
N80-10970
N80-10110
N80-10345
N80-10708
N80-10477
N80-10149
N80-10942
N80-10751
N80-10751
N80-10042
N80-10675
N80-10568
N80-10792
N80-10176
N80-10211
N80-10575
N80-10668
N80-10345
N80-10185
N80-10697
N80-10458
N80-10465
N80-10560
N80-10560
N80-10124
N80-10319
N80-10194
N80-10921
N80-10685
N80-10334
N80-10275
N80-10329
N80-10918
N80-10283
N80-10779
N80-10935
N80-10701
N80-10312
N80-10054
N80-10774
N80-10279
N80-10994
N80-10870
N80-10871
N80-10261
N80-10262
N80-10776
N80-10149
N80-10591
N80-10917
N80-10594
N80-10653
N80-10974
N80-10719
N80-10171
N80-10830
N80-10758
N80-10896
BOLEY, D. L. N80-10024
BOLING, N. L. N80-10830
BOLSHOV, L. A. N80-10821
BOMELBURG, H. N80-10837
BONNET, C. N80-10816
BONNY, A. N80-10382
BOONE, J. O. N80-10035
BORDONSKIY, G. S. N80-10984
BOREL, M. J. N80-10423
BORG, R. J. N80-10643
BORISOV, N. B. N80-10521
BORISOVA, L. I. N80-10532
BOROVIK, V. O. N80-10230
BORREGO, J. M. N80-10105
BORSTAD, G. N80-10479
BOTT, R. A. N80-10575
BOWDEN, J. J. N80-10413
BOWDITCH, D. N. N80-10280
BOWLEY, C. J. N80-10282
BOWMAN, B. R. N80-10873
BOWSER, J. R. N80-10161
BOYAJIAN, A. N. N80-10192
BOYCE, D. E. N80-10036
BRADLEY, P. F. N80-10658
BRADSHAW, P. N80-10517
BREED, C. S. N80-10916
BREED, W. J. N80-10518
BREMHORST, K. N80-10474
BRENNAN, J. J. N80-10361
BREUL, H. Y. N80-10995
BREVNOV, N. N. N80-10878
BREWER, D. A. N80-10004
BREWER, R. G. N80-10478
BROAD, P. N80-10033
BROOK, J. W. N80-10217
BROOKS, J. N. N80-10647
BROOKS, W. T. N80-10876
BROVKO, O. N80-10838
BROWN, A. J. N80-10696
BROWN, R. N80-10544
BROWN, R. S. N80-10543
BRUSHKOVSKII, A. I. N80-10763
BRYANTSEV, I. A. N80-10815
BUCKINGHAM, A. C. N80-10608
BUDANOV, V. V. N80-10005
BUJAK, A. N80-10019
N80-10645
BUNCE, R. C. N80-10254
N80-10691
BURAVKOVA, I. B. N80-10892
BURBY, R. J. N80-10498
BURGER, S. J. N80-10862
BURKE, R. J. N80-10970
BURLEY, R. R. N80-10822
BURNS, P. N80-10252
BUSCH, S. P. N80-10889
BUSINGER, S. N80-10741
BUTTERFIELD, F. E. N80-10320
BUZBEE, B. L. N80-10322
BYCHKOV, V. P. N80-10768
BYRNES, J. L. N80-10112

C

CALIA, V. N80-10329
CALLAWAY, J. N80-10868
CAMPBELL, G. M. N80-10201
CAMPBELL, R. N80-10634
CANNADAY, R. L. N80-10225
CANNON, R. M., JR. N80-10318
CAPUTO, B. N80-10649

CARDARELLI, D. N80-10930
CARLEY, W. N80-10741
CARLOS, W. E. N80-10925
CARLSON, R. W. N80-10105
CARR, L. W. N80-10465
CARROLL, R. J. N80-10839
CARTER, B. F., III N80-10811
CASSELL, R. E. N80-10864
CASTLE, C. B. N80-10512
CATALANO, G. D. N80-10126
CAVAGNARO, D. M. N80-10666
N80-10669
N80-10670
N80-10671
N80-10672
N80-10680
N80-10681
N80-10682
N80-10947
N80-10948
CAVENY, L. H. N80-10294
CERICI, T. N80-10465
CERINI, D. J. N80-10574
CHANDLER, W. S. N80-10742
CHANDRA, A. N80-10937
N80-10938
CHANG, S. S. N80-10372
CHAPMAN, L. D. N80-10892
CHARTERS, A. C. N80-10271
CHEETHAM, C. M. N80-10247
CHENG, E. P. N80-10849
CHENG, K. F. N80-10848
CHERIEMUKRIN, G. A. N80-10044
N80-10060
CHERNICK, M. R. N80-10844
CHERNIKOV, S. E. N80-10047
CHERNYAKOV, I. N. N80-10773
CHERNYSHEV, L. L. N80-10090
CHERVAKOV, V. V. N80-10066
CHESTEK, R. N80-10419
CHIANTA, M. A. N80-10783
CHIN, R. A. J. N80-10343
CHIN, L. Y. N80-10375
CHIRVA, L. G. N80-10030
CHISTYAKOV, I. I. N80-10048
CHOCKALINGAM, M. P. N80-10684
CHODZKO, R. A. N80-10331
CHON, K. S. N80-10697
CHRISMAR, P. H. N80-10888
CHRISTENSEN, L. G. N80-10731
CHRISTENSEN, M. N. N80-10619
CHRISTENSEN, U. R. N80-10446
CHRISTNER, L. N80-10603
CHRISTOFIDES, N. N80-10837
CHRYSOCHOOS, J. N80-10650
CHU, K. W. N80-10681
CHUNG, W. Y. N80-10710
CHUPLUCH, C. C. N80-10218
CIPOLLINI, N. E. N80-10941
CLAUSING, R. N80-10921
CLEMM, D. S. N80-10141
CLINE, M. C. N80-10470
CLYNE, F. N80-10962
COFFER, J. G. N80-10331
COGHE, A. N80-10311
COHAN, D. N80-10692
COHEN, N. S. N80-10292
COLE, R. E. N80-10795
COLTRIN, R. E. N80-10216
COMFORT, W. J. N80-10688
CONDON, E. N80-10711
CONN, R. L. N80-10818
COOPER, D. W. N80-10276
CORDES, M. R. N80-10474
CORNWELL, L. W. N80-10828
COWAN, R. N80-10614
COX, B. L. N80-10354
COX, D. B., JR. N80-10173
COX, J. J., JR. N80-10199
COY, J. J. N80-10213
CRAFTS, C. C. N80-10641
CRAIG, R. B. N80-10694
CRAINE, E. R. N80-10978
CROMWELL-CAIN, K. N80-10697
CRONVICH, L. L. N80-10103
CRUMP, J. E. N80-10303
CUELLAR, J. P., JR. N80-10223
CULICK, F. E. C. N80-10301
CURTIS, B. N80-10825
CYBULSKI, J. N80-10062

D

DALLI, R. E. N80-10578
DAMOULAKIS, J. N. N80-10149
DANIELS, E. L. N80-10395
DANILAEV, P. G. N80-10076
DANKER, P. D. N80-10187
DARDEN, C. M. N80-10102
DAURIO, A. N80-10657
DAVENAS, A. N80-10300
DAVEY, K. R. N80-10461
DAVIES, T. J. N80-10912
DAVIS, D. D. N80-10690
DAWSON, P. R. N80-10928
DEAN, D. S. N80-10113
N80-10316
DEAN, W. N., JR. N80-10120
DEASON, V. A. N80-10469
DEBAERE, L. A. N80-10398
DEGTYAREV, G. L. N80-10037
N80-10040
N80-10043
N80-10362
N80-10112
DEGTYAREV, Y. D. N80-10940
DEIASI, R. N80-10285
DEJOODE, A. D. N80-10304
DELEPREVIER, A. G. N80-10311
DELUCA, L. N80-10149
N80-10437
N80-10784
N80-10920
DELZER, D. R. N80-10826
DEMERDASH, N. A. O. N80-10704
DEMPSEY, J. A. N80-10296
DENAVIT, J. N80-10303
DENNIS, J. B. N80-10280
DENOS, R. N80-10870
DERR, R. L. N80-10683
N80-10774
N80-10661
N80-10882
N80-10394
N80-10207
N80-10288
N80-10551
N80-10584
N80-10884
N80-10182
N80-10232
N80-10614
N80-10503
N80-10275
N80-10183
N80-10130
N80-10754
N80-10364
N80-10743
N80-10041
N80-10385
N80-10978
N80-10206
N80-10608
N80-10838
N80-10584
N80-10999
N80-10119
N80-10140
N80-10435
N80-10013
N80-10914
N80-10836
DESINGER, W. H. N80-10937
DEVENSKY, A. N80-10938
DEVRIES, G. N80-10372
DIANOV, A. G. N80-10892
DIBELLO, E. G. N80-10271
DICUS, D. A. N80-10247
DIEDRICH, J. H. N80-10849
DIEHL, L. A. N80-10848
DIESINGER, W. N80-10044
DIETZ, R. S. N80-10060
DILLARD, C. A. N80-10844
DILLON, R. Y. N80-10047
DINTER, E. N80-10773
DISTELRATH, H. D. N80-10090
DIVINE, J. N80-10066
DODD, B. D. N80-10419
DODDS, J. N80-10783
DODDINGTON, S. R. N80-10343
DONHAM, R. E. N80-10375
DOTSENKO, M. A. N80-10030
DRAGO, R. S. N80-10048
DREVES, D. N80-10684
DRUZHININ, G. V. N80-10331
DRYER, F. L. N80-10697
DUERR, R. E. N80-10888
DUGAN, J. F., JR. N80-10731
DUGAN, V. L. N80-10619
DUGRE, J. P. N80-10446
DURFEE, R. C. N80-10603
DURNEV, A. N80-10837
DUVVURI, T. N80-10650
DVORAK, F. A. N80-10681
DYACHENKO, V. F. N80-10710
DYATLOV, I. N. N80-10218
DYRNE, A. M. N80-10941
DZHAMGAROV, G. M. N80-10921
N80-10141
N80-10470
N80-10962
N80-10331
N80-10311
N80-10692
N80-10292
N80-10795
N80-10216
N80-10688
N80-10711
N80-10818
N80-10276
N80-10474
N80-10828
N80-10614
N80-10354
N80-10173
N80-10199
N80-10213
N80-10641
N80-10694
N80-10978
N80-10697
N80-10103
N80-10303
N80-10223
N80-10301
N80-10825
N80-10062

E

EARLY, R. A. N80-10423
EASTMAN, L. F. N80-10937
N80-10938
EASTMAN, T. E. N80-10715
EASTON, R. L. N80-10157
ECKHARDT, D. E., JR. N80-10854
EDENBURN, M. W. N80-10638
EDESESS, M. N80-10663
EDWARDS, A. L. N80-10742
EDWARDS, D., JR. N80-10480
EHLERS, G. F. L. N80-10365
EISENBERG, R. L. N80-10180
EKONOMOV, A. P. E. N80-10908
EL-ASHRY, M. T. N80-10573
EL-BAZ, F. N80-10538
N80-10539
N80-10546
N80-10547
N80-10553
N80-10554
N80-10555
N80-10556
N80-10558
N80-10559
N80-10567
N80-10569
N80-10571
N80-10577
N80-10543
N80-10546
N80-10547
N80-10553
N80-10636
N80-10462
N80-10050
N80-10001
N80-10717
N80-10398
N80-10909
N80-10265
N80-10177
N80-10089
EL-ETR, R. A.
ELLICKSON, P. L.
ELLINWOOD, J. W.
ELLIS, G. S.
ELLSAESSER, H. W.
ELLSWORTH, D. A.
ELMER, B. R.
ELYASBERG, P. Y.
EMARA-SHABAIK, H. E.
EMIN, O. N.
ENGELS, A. N80-10511
ENGI, D. N80-10092
ENGLISH, R. A. N80-10654
ENGLUND, D. R., JR. N80-10214
ENNULAT, R. D. N80-10935
ERICKSEN, R. B. N80-10144
ERMAKOV, V. V. N80-10924
ERRICO, P. B. N80-10399
ERSHOV, N. S. N80-10066
ESCHER, W. J. D. N80-10383
ETKIN, V. S. N80-10477
ETTENBERG, M. N80-10600
EVANS, G. I. N80-10307
EVIN, O. A. N80-10065

F

FABER, J. A. N80-10584
FABRIZIO, W. A. N80-10165
FAHNESTOCK, R. J. N80-10244
FAIRALL, C. W. N80-10737
FAKHRUTDINOV, R. D. N80-10069
FALKENBORG, D. H. N80-10977
FANTONE, S. D. N80-10908
FARAHAT, M. N80-10970
FARRIS, D. R. N80-10646
FASSEL, V. A. N80-10787
FECHTER, R. R. N80-10650
FEHLER, C. E. N80-10208
FEJER, A. A. N80-10391
FELDMAN, W. C. N80-10984
FENG, C. C. N80-10330
FENG, I. A. N80-10931
FIGUEROA, L. N80-10487
FILIN, V. A. N80-10021
FINCKE, J. R. N80-10469
FINGER, D. G. N80-10522
FINOGENOVA, R. I. N80-10774
FISHBEIN, B. D. N80-10029
FISHER, S. N80-10795
FIX, G. A. N80-10817
FLAUGH, R. L. N80-10381
FLECHNER, S. G. N80-10101
FLEMING, D. N80-10213
FLEMING, E. S. N80-10390
FLORIN, H. N80-10289
FLOTOW, H. E. N80-10954
FLOWERS, M. C. N80-10867
FLYNN, G. W. N80-10421
FOA, J. V. N80-10117
FONG, T. S. N80-10227
FONTANA, J. J. N80-10323
FOOSE, R. M. N80-10542
FORSBERG, H. C. N80-10970
FORSTER, H. V. N80-10786
FORSYTH, E. B. N80-10441
FOSTER-PEGG, R. W. N80-10605
FOW, B. R. N80-10734
FRANKE, M. E. N80-10120
FREEDMAN, D. N80-10398
FREILEY, A. J. N80-10258
FRIEDMAN, P. S. N80-10650
FRINGER, J. M. N80-10399
FU, L. S. N80-10348
FUCHSER, T. D. N80-10169
FULMAN, R. L. N80-10369

G

GALFETTI, L. N80-10283
GALITSEISKII, B. M. N80-10064
GALLICCHIO, J. A. N80-10794
GALPER, A. M. N80-10478
GANY, A. N80-10294
GARIN, J. N80-10499
GARLAND, R. V. N80-10605
GARTRELL, G., JR. N80-10454
GATOS, H. C. N80-10939
GAUL, J. H. N80-10364
GAUMOND, C. F. N80-10858
GAZENKO, O. G. N80-10752
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GERASHCHENKO, O. A. N80-10459
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GETTYS, C. N80-10795
GHANDHI, S. K. N80-10675
GIANNINI, R. J. N80-10187
GIBSON, W. C. N80-10197
N80-10198
GIDDINGS, J. M. N80-10747
GIESEKE, J. A. N80-10460
GIFFORD, A. W. N80-10554
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GILMAN, P. S. N80-10340
GINZBURG, S. L. N80-10435
GIORGINI, A. N80-10509
GIULI, R. T. N80-10539
GLASGLOW, T. K. N80-10210
GLASSEY, C. R. N80-10623

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GLAWE, G. E. N80-10214
GLAZER, B. G. N80-10170
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GLOD, G. D. N80-10761
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GOETZ, L. E. N80-10543
GOGOLEV, I. G. N80-10077
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GOLDUN, L. P. N80-10078
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GOLOVIN, M. N. N80-10460
GOLOVIN, Y. M. N80-10908
GOLUB, G. H. N80-10855
GOODYEAR, M. J. N80-10231
GOROZHANKIN, N. A. N80-10653
GORSHKOV, V. P. N80-10767
GORTYSHOV, Y. F. N80-10007
GOSLING, J. T. N80-10904
GOTZMER, C. N80-10298
GRACH, S. A. N80-10908
GRADY, L. M. N80-10892
GRAN, R. L. N80-10463
GREEN, D. S. N80-10107
GREEN, D. T. N80-10313
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GREEN, K. A. N80-10110
GREEN, T. A. N80-10893
GREENBERG, J. S. N80-10852
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GRIDOV, L. A. N80-10866
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GRIFFIN, J. J. N80-10842
GRIGORENKO, P. P. N80-10006
GRIGORYEV, A. I. N80-10754
GRIGSBY, M. N80-10743
GRIMES, R. N. N80-10333
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GRIMES, S. M. N80-10873
GRIMM, U. N80-10386
GRO, M. N80-10478
GROBMAN, J. N80-10209
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GROSS, B. J. N80-10642
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GROSSBECK, M. L. N80-10355
GROSSKREUTZ, C. L. N80-10987
GRUZDEV, V. N. N80-10008
GUDERLEY, K. G. N80-10141
GUERNIGOU, J. N80-10284
GUERNSEY, J. L. N80-10585
GUILLEN, L. A. N80-10810
GUINTHER, E. B. N80-10744
GUMEROV, K. S. N80-10003
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GUROV, A. N. N80-10771
GURWELL, W. E. N80-10625
GYULASSY, M. N80-10894

H

HAAS, J. E. N80-10212
HAAS, W. J., JR. N80-10787
HABERCOM, G. E., JR. N80-10505
N80-10506
N80-10530
N80-10531
HACKETT, C. E. N80-10642
HADJIGEORGHIOU, G. A. N80-10326
HAEUSLEIN, G. E. N80-10960
HAGGMARK, L. G. N80-10916
HAGIN, F. N80-10845
HAIGHT, R. C. N80-10873
HAISLER, W. E. N80-10523
N80-10525
HAKE, C. L. N80-10786
HALE, J. A. N80-10460
HALFORD, G. R. N80-10210
HALL, A. R. N80-10290
HALOW, J. S. N80-10386
HALPERN, L. N80-10856
HAM, N. C. N80-10251
HAMILTON, J. M. N80-10503
HAMMERSMA, J. W. N80-10696
HAMMOND, R. D. N80-10504
HANISH, S. N80-10862
HANN, R. L. N80-10796
HANNAN, B. N80-10153
HARBOUR, W. H. N80-10166
HARDY, J. A. N80-10484
HARDY, K. R. N80-10729
HARE, R. C. N80-10622
HAREL, M. N80-10712
HARLOFF, G. J. N80-10098
HARRINGTON, R. L. N80-10165
HART, R. G. N80-10519
HARTLEY, J. N. N80-10625
HARTT, W. H. N80-10350
HARVEY, R. C. N80-10417
HAUSER, C. H. N80-10212
HAUSZ, W. N80-10622
HAVE, A. C. N80-10796
HAYMES, W. G. N80-10283
HAZELRIGG, G. A., JR. N80-10962
HEALEY, R. M. N80-10684
HEDMAN, S. G. N80-10143
HEINEN, J. N80-10190
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HEMENWAY, D. N80-10476
HENDERSON, J. N80-10278
HENGBOLD, W. M. N80-10134
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HENNING, M. A. N80-10790
HENRY, F. F. N80-10241
HENRY, R. J. W. N80-10585
HERMAN, M. N80-10626
HERTEL, R. J. N80-10469
HESS, D. A. N80-10520
HESS, J. L. N80-10436
HICKOX, C. E. N80-10414
HICKS, R. E. N80-10404
HIGA, W. N80-10830
HILL, G. N80-10633
HILLER, C. C. N80-10235
HINDERER, J. H. N80-10719
HINSHELWOOD, D. N80-10236
HINTERMANN, B. E. N80-10941
HINZ, H. N80-10574
HITTLE, D. C. N80-10280
HO, A. N80-10586
HOFFMAN, E. C. N80-10584
HOFFMAN, L. G. N80-10715
HOFFMAN, R. A. N80-10985
HOLMAN, G. L. N80-10707
HOLROYD, R. A. N80-10536
HOLZ, R. K. N80-10566
HOMBURG, A. N80-10698
HONEA, R. N80-10486
HONEA, R. B. N80-10978
HONES, E. W., JR. N80-10172
HOOD, L. L. N80-10548
HOOGHEEM, T. J. N80-10333
HOPKIN, V. D. N80-10374
HOPKINS, T. S. N80-10137
HORIE, Y. N80-10222
HORN, K. A. N80-11001
HORNER, V. M. N80-10600
HOROWITZ, L. L. N80-10413
HORRALL, K. B. N80-10970
HOSMANE, N. S. N80-10088
HOUSEMAN, J. N80-10306
HOWE, R. M. N80-10892
HOWLETT, R. A. N80-10126
HRECHKO, H. M. N80-10222
HUANG, H. C. N80-10004
HUANG, M. Y. N80-10247
HUDSON, C. L. N80-10163
HUFF, S. L. N80-10828
HUGHES, P. M. N80-10628
HULME, R. L. N80-10841
HUMPHRIS, R. R.
HUNT, R. B.
HUNTOON, R. B.
HURD, W. J.
HURLEY, M. J.
HUTCHINSON, P. A.
HYMAN, E. A.
HYMAN, J. M.

I

IANNUCCI, J. J.
IMHOFF, C. L.
INMAN, R. E.
ISAEV, V. V.
ISAYENKO, V. V.
IVANOV, L.
IVANOV, V. S.
IVANSHIN, Y. N.
IWASAKI, R.
IZAKOV, M. N.

J

JACKSON, D. R. N80-10395
JACKSON, J. D. N80-10887
JACOBS, V. L. N80-10278
JAFFE, C. N80-10865
JAMES, R. N80-10276
JAMESON, A. N80-10142
JANZ, G. J. N80-10643
JAVADEV, T. S. N80-10663
JAWORSKI, E. N80-10590
JAY, A. N80-10515
JELLISON, J. L. N80-10501
JENKINS, E. N80-10870
N80-10871
JOHNSON, C. D. N80-10197
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JOHNSON, C. R. N80-10169
JOHNSON, H. C. N80-10164
JOHNSON, M. E. N80-10851
JOHNSON, P. N80-10586
JOHNSON, R. M. N80-10351
JOKIEL, P. L. N80-10744
JONES, C. E. N80-10514
JONES, C. R. N80-10491
JONES, G. F. N80-10660
JONES, H. E. N80-10596
JONES, O. C., JR. N80-10468
JONES, R. E. N80-10207
JUDD, D. C. N80-10378

K

KALACHEVA, G. S. N80-10769
KALINKIN, L. F. N80-10478
KALITKIN, N. N. N80-10924
KALUGIN, V. T. N80-10079
KAMENSKIY, Y. N., N80-10757
KAMIDE, Y. N80-10718
KAMPA, D. N80-10308
KARBOWSKI, J. S. N80-10919
KARKALIK, F. G. N80-10135
KASHFRAZIEV, Y. A. N80-10052
KATALOV, M. I. N80-10755
KAUFMAN, J. N80-10786
KAYLONCU, A. A. N80-10395
KAZACHKOV, A. A. N80-10921
KEELEN, M. H., JR. N80-10786
KEETON, A. R. N80-10494
KELLEY, D. F. N80-10867
KELLOGG, C. N80-10957
KEMMIE, J. E. N80-10472
KEMP, G. J. N80-10591
KENNEDY, E. W. N80-10835
KENTFIELD, J. A. C. N80-10125
KERL, P. N80-10478
KEY, G. S. N80-10744
KHABIBULLIN, M. G. N80-10091
KHACHATURYAN, O. A. N80-10018
KHAIRUTDINOV, R. M. N80-10026
KHALATOV, A. A. N80-10073
KHAMIDULLIN, F. A. N80-10074
KHAPIN, Y. B. N80-10477
KHARE, J. M. N80-10125
KHATTAK, C. P. N80-10398
KHULLAR, S. N80-10099
KIENHOLZ, D. A. N80-10197
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KIHARA, R. N80-10440
KIM, Y. N80-10349
KIMES, D. S. N80-10535
KINDLE, E. C. N80-10711
KINELEV, V. G. N80-10010
KIRK, B. L. N80-10950
KIRSANOV, Y. A. N80-10477
KISELEV, V. P. N80-10914
KIVLIGHN, H. D. N80-10362
KLAHR, P. N80-10957
KLEBANOVA, T. V. N80-10879
KLEIN, J. P. N80-10786
KLEIN, O. N80-10702
KLEMAS, V. N80-10687
KLEMM, R. A. N80-10704
KLINE, R. N80-10629
KLYUEV, N. I. N80-10084
KNOX, C. E. N80-10152
KOBISK, E. H. N80-10090
KOCHER, H. R. N80-10436
KOENIG, D. G. N80-10107
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KOH, J. L. N80-10263
KOLB, C. E. N80-10332
KOLB, E. W. N80-10082
KOLBE, W. F. N80-10483
KOLOMENSKIY, A. V. N80-10770
KONDRATYEV, A. N. N80-10763
KONKEL, R. S. N80-10693
KOPITSKE, E. R. N80-10160
KORDYUM, V. I. N80-11001
KORNOUKHOV, A. A. N80-10027
KOROLEV, P. V. N80-10077
KOROLKOV, V. I. N80-10754
KOSHEVOI, V. N. N80-10879
KOSTENKO, F. I. N80-10908
KOSTENKO, V. S. N80-10030
KOSTKOWSKI, H. J. N80-10740
KOTEK, T. J. N80-10829
KOTEN, F. N80-10478
KOTLYAR, L. M. N80-10011
KOVALENKO, Y. A. N80-10776
KOVALEV, A. A. N80-10027
KOVALNOGOV, N. N. N80-10021
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KOZELKOV, V. P. N80-10070
KOZHAKHMETOV, K. K. N80-10908
KOZHEVNIKOV, Y. V. N80-10042
KOZLOV, V. D. N80-10478
KOZLOV, Y. I. N80-10079
KOZLOWSKI, H. N80-10204
N80-10220
KOZYREYSKAYA, G. I. N80-10754
KRAEUTLE, K. J. N80-10296
KRAFT, M. L. N80-10696
KRAMER, J. L. N80-10163
KRASNYCH, I. G. N80-10759
KRAVCHENKO, M. K. N80-10477

KRESOVICH, S. N80-10395
KRETOL, D. N80-10478
KRETOV, A. S. N80-10043
KRICBAKIS, V. I. N80-10028
N80-10089
KRIKORIAN, M. J. N80-10150
KRISHTAL, V. I. N80-10082
KRIVOSHEEV, I. A. N80-10081
KROEBEL, H. W. N80-10718
KROPACEVA, K. N80-10760
KRUCK, J. E. N80-10498
KRUPKA, M. C. N80-10637
KRYUCHKOV, V. A. N80-10766
KUDASHEV, Y. D. N80-10077
KUDRYASHEV, L. I. N80-10084
KUENTZMAN, P. N80-10302
KUIZENGA, D. J. N80-10490
KULLEE, D. N80-10440
KULLMAN, B. C. N80-10970
KUMAR, A. N80-10349
KUPISZEWSKI, A. N80-10246
KURGANOV, A. M. N80-10070
KURSHIN, L. M. N80-10039
KUSTOM, R. L. N80-10918
KUSTOV, V. V. N80-10763
KUSUNOSE, K. N80-10092
KUTYSH, I. I. N80-10089
KUZIN, A. F. N80-10074
KUZMICHEV, B. V. N80-10083
KUZMIN, V. I. N80-10096
KUZNETSOV, A. N80-10070
N80-10071
KUZNETSOV, N. V. N80-10921
KUZNETSOV, V. S. N80-10755
KUZNETSOVA, M. A. N80-10762
KWOH, D. S. W. N80-10932

L

LADY, C. M. N80-10607
LAFEVERS, J. R. N80-10585
LAIRD, J. C. N80-10566
LAM, C. C. N80-10928
LAMAR, N. Y. N80-10578
LAMPERT, A. N80-10293
LANDSBAUM, E. M. N80-10286
LANE, R. O. N80-10872
LANTZ, B. B. N80-10884
LAPAYEV, E. V. N80-10755
LAPSHIN, V. V. N80-10097
LARSON, G. L. N80-10910
LARSON, L. A. N80-10933
LASLEY, E. L. N80-10168
LAU, K. Y. N80-10245
LAVIN, J. K. N80-10732
LAWSON, W. T. N80-10395
LAYLAND, J. W. N80-10247
LAZARETH, O. W. N80-10922
LEAR, W. M. N80-10907
LEBOEUF, C. M. N80-10652
LEE, A. Y. N80-10919
LEE, D. R. N80-10233
LEE, E. S. N80-10815
LEE, J. M. N80-10649
LEE, J. R. N80-10336
LEE, K. H. N80-10424
LEE, K. W. N80-10460
LEES, D. E. S. N80-10901
LEFCOCHILOS, E. N80-10509
LEFLAR, J. A. N80-10653
LEGGETT, N. E. N80-10629
LEITES, E. N80-10337
LENGELLE, G. N80-10284
LENZ, T. N80-10656
LEONARD, D. A. N80-10609
LEONARD, J. A. N80-10609
LEONDES, C. T. N80-10154
N80-10227
N80-10229
N80-10422
LEONOVA, A. R. N80-10750
LESKOVAR, B. N80-10483
LETKOVA, L. I. N80-10765
LEVINE, S. R. N80-10210
LEVY, P. G. N80-10819
LEVY, S. C. N80-10641
LEWIS, B. L. N80-10515
LEWIS, E. L. N80-10133
LEWIS, J. N80-10474
LEWIS, M. A. N80-10788
LEWIS, M. F. N80-10151
LEWIS, R. N80-10977
LEWIS, W. H. N80-10503
LICHTNER, P. C. N80-10842
LIEBERMAN, G. N80-10411
LIEPMAN, H. P. N80-10493
LILIE, L. N80-10741
LIMA, P. M. N80-10946
LIND, M. A. N80-10613
LINDE, D. N80-10297
LINDMAN, E. L. N80-10911
LING, R. Y. S. N80-10425
LIOR, N. N80-10660
LIPATOV, A. S. N80-10990
LIPINSKY, E. S. N80-10395
LISOVSKIY, G. M. N80-10709
LITCHFIELD, J. W. N80-10625
LITTMAN, F. N80-10702
LOCKWOOD, H. E. N80-10578
N80-10579
N80-10580
N80-10652
LOEF, G. O. G. N80-10423
LOEW, G. A. N80-10221
LOHMAN, R. P. N80-10822
LOKAI, K. V. N80-10068
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LOKAI, V. I. N80-10067
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LOONEY, L. D. N80-10107
LOPEZ, A. E. N80-10360
LOREMAN, J. N80-10610
LOTKER, M. N80-10381
LOUGHRAN, E. D. N80-10799
LOVELL, J. S. N80-10129
LOWRY, R. B. N80-10882
LUBATTI, H. J. N80-10138
LUDTKE, W. P. N80-10640
LUKENS, L. L. N80-10256
LUVALLE, J. N80-10912
LYONS, P. R. N80-10004
LYULKA, L. A.

M

MA, E. N80-10932
MACH, K. D. N80-10822
MACK, D. P. N80-10134
MACK, R. J. N80-10102
N80-10105
N80-10927
MACKAY, H. B. N80-10899
MADAN, S. S. N80-10936
MADJAR, A. N80-10808
MADNICK, S. E. N80-10221
MADOR, R. J. N80-10247
MADRID, G. A. N80-10077
MAGALA, V. A. N80-10366
MAGILL, J. H. N80-10897
MAHALINGAM, R. N80-10583
MAIER, D. C. N80-10436
MAILLAT, M. N80-10776
MAILYAN, E. S. N80-10284
MAISONNEUVE, Y. N80-10606
MAJUMDAR, S. N80-10237
MAKINNEY, R. L. N80-10871
MALAMUD, E. N80-10024
MALINOVSKII, K. A. N80-10008
MALSHEVSKAYA, N. A. N80-10115
MALMUTH, N. D. N80-10764
MAMALYGA, L. M. N80-10493
MANET, R. T. N80-10795
MANNING, C. N80-10590
MANSFIELD, P. J. N80-10812
MANWARING, M. L. N80-10457
MARCUS, P. S. N80-10979
N80-10980
N80-10766
MAREVEYA, N. S. N80-10011
MARGULIS, S. G. N80-10758
MARKARYAN, M. V. N80-10093
MARSH, J. E. N80-10980
MARSHALL, R. D. N80-10175
MARTIN, E. E. N80-10417
MARTIN, J. S. N80-10418
MARTINS-CAMELO, L. F. N80-11001
MASHYNSKYY, O. L. N80-10140
MASKEW, B. N80-10123
MASSIER, P. F. N80-10296
MATHES, R. B. N80-10303
N80-10175
MATTHEWS, C. N80-10022
MATVEEV, Y. V. N80-10044
MATYAR, A. L. N80-10923
MAU, T. K. N80-10145
MAUK, S. C. N80-10146
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MAUL, G. A. N80-10562
N80-10555
N80-10572
MAXWELL, T. A. N80-10314
N80-10355
MAY, D. H. N80-10439
MAZIASZ, P. J. N80-10283
MCCABRIA, J. L. N80-10395
MCCLENDON, S. E. N80-10003
MCCLURE, T. A. N80-10357
MCCONVILLE, J. T. N80-10372
MCCOY, H. E., JR. N80-10972
MCCRACKIN, F. L. N80-10249
MCCRODDEN, B. A. N80-10464
MCELHICE, R. J. N80-10257
MCFADDEN, B. L. N80-10380
MCGINNESS, H. N80-10233
MCGREGOR, W. K. N80-10551
MCGUIRE, D. C. N80-10552
MCHONE, J. F. N80-10561
N80-10735
MCLAFFERTY, S. N80-10211
MCNAB, O. F. N80-10196
MCNALLY, W. D. N80-10785
MCNAMARA, B. A., JR. N80-10144
MCNEANY, J. L. N80-10959
MEADOR, J. T. N80-10502
MEFFERD, L. A. N80-10136
N80-10131
MEHLE, T. N80-10795
MEI, J. S. N80-10306
MELNIKOVA, Y. P. N80-10761
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MUSTAPHA, J. R. N80-10442
MYERS, G. E. N80-10827

N

NADEZHIN, D. K. N80-10983
NAGARAJA, K. S. N80-10107
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NANCE, H. E. N80-10242
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NEIL, T. W. N80-10437
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NORTH, D. W. N80-10422
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NOVAK, L. M. N80-10680
NOVIKOV, I. D. N80-10143
NOWOGRODZKI, M.
NYUBERG, S. G.

O

OCONNELL, L. G. N80-10970
OEY, K. T. N80-10403
OHANLON, J. F., JR. N80-10790
OHNISHI, K. N80-10178
OLSEN, T. J. N80-10658
OLSON, K. W. N80-10787
OPDYCKE, G. L. N80-10650
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ORLOV, V. V. N80-10887
ORTWERTH, P. J. N80-10114
OSORGIN, V. D. N80-10045
OSTERMANN, H. N80-10511
OTOSHI, T. Y. N80-10259

P

PACIOREK, K. J. L. N80-10358
PACKMAN, A. B. N80-10204
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PAFFENHOFER, G. A. N80-10742
PAHWA, S. B. N80-10884
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POLNAREV, A. G. N80-10983
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PRIEBE, S. J. N80-10089
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PROVENZANO, G. N80-10697
PRYSLAK, M. N80-10561
PUROHIT, A. N80-10953
PUTNAM, A. A. N80-10480
PYATLOV, I. N. N80-10965

Q

QUIGG, C.
QUINBY, T. C. N80-10887
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R

RABINOVITCH, B. S. N80-10867
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RAMODINA, V. V. N80-10866
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S

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SCHUBERT, F. H. N80-10080
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SCHULTZ, A. J. N90-10553
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SCHUSTER, G. R. N80-10486
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SCHWARTZ, S. H. N80-10592
SCHWITTERS, R. F. N80-10096
SCOTT, J. N80-10349
SEARLES, S. E. N80-10489
SEBELIEN, K. R. N80-10302
SECHI, F. N. N80-10680
SEEVERS, J. A. N80-10237
SEGASER, C. L. N80-10627
SEIDAN, N. N80-10298
SEILER, M. R. N80-10122
SELLERS, J. F. N80-10218
SEMENOV, V. N. N80-10059
SENGUPTA, D. L. N80-10418
SENSALARI, G. L. N80-10311
SERFLING, R. J. N80-10047
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SHAIKHUTDINOV, Z. G. N80-10081
SHAKHOV, V. G. N80-10025
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SHANNON, T. E. N80-10919
SHARAPOV, A. N. N80-10477
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SHASKOV, V. S. N80-10749
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SHCHUKIN, A. V. N80-10020
SHCHUKIN, V. A. N80-10013
SHCHUKIN, V. E. N80-10021
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SHELOBOV, N. A. N80-10053
SHELTON, S. N80-10703
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SHIFRIN, B. A. N80-10077
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SHISHOV, E. V. N80-10019
SHMIDT, V. M. N80-10097
SHOGREN, R. K. N80-10612
SHOTLAND, S. N80-10657
SHUBERT, E. A. N80-10328
SHULL, T. A. N80-10433
SHULTS, I. N80-10736
SHUMACHENKO, V. G. N80-10075
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SHVARTSMAN, P. I. N80-10069
SIEVERS, U. N80-10004
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SIDOROV, O. P. N80-10045
SIDOROVA, S. O. N80-10045
SIEGEL, H. M. N80-10339
SIEVERS, M. N80-10250
SIGNORELLI, R. A. N80-10210
SILVER, L. T. N80-10540
SIMMONS, G. W. N80-10519
SIMMONS, J. M. N80-10124
SIMMONS, L. M., JR. N80-10951
SIMMONS, R. N80-10731
SINGER, J. J. N80-10742
SINGH, V. N80-10592
SIRAZETDINOV, T. K. N80-10016
SITTON, O. C. N80-10376
SKCHUKIN, A. V. N80-10026
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SKLAR, J. R. N80-10172
SLANSKY, R. N80-10875
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SLOAN, K. R., JR. N80-10823
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SMITH, D. A. N80-10910
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SMITH, S. V. N80-10744
SNYDER, S. W. N80-10399
SOCKOL, P. M. N80-10211
SOKOLOVA, T. A. N80-10757
SOLHEIM, F. N80-10741
SOLLID, J. E. N80-10492
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SOLOMON, A. D. N80-10843
SOLOVYEVA, T. I. N80-10751
SOLOWEY, C. N80-10186
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SORENSON, R. N80-10143
SOUTHERN, G. R. N80-10290
SOUTHWORTH, F. N80-10697
SPENCER, F. A. N80-10148
SPIKER, J. J., JR. N80-10159
SPIRIDONOV, V. A. N80-10006
SPIRO, R. W. N80-10712
SPRADLIN, G. L. N80-10255
SPROAT, W. R. N80-10703
SPUCK, W. R., III N80-10709
SQUYERS, R. A. N80-10121
STALANTOV, A. V. N80-10075
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STANLEY, D. J. N80-10365
STANSELL, T. A., JR. N80-10156
STANTON, J. S. N80-10785
STENKIN, E. D. N80-10071
STEPKA, F. S. N80-10212
STERLIN, V. A. N80-10044
STERNBERG, R. J. N80-10791
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STEVENSON, R. E. N80-10564
STEWART, D. J. N80-10706
STEWART, R. D. N80-10706
STITT, L. E. N80-10216
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STRECKER, R. A. H. N80-10297
STREIFF, R. C. N80-10130
STRELNITSKIY, V. S. N80-10981
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SUIT, W. T. N80-10225
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SYDNOR, R. N80-10248
SYMES, D. N80-10175
SYTNIK, S. I. N80-10761
SYTNKY, K. M. N80-11001
SZUCH, J. R. N80-10215

T

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TALYZIN, V. A. N80-10042
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TANIMOTO, S. L. N80-10823
TARASENKO, G. I. N80-10755
TARSQUE, I. N80-10429
TAUGER, M. D. N80-10068
TAYLOR, R. D. N80-10410
TAYLOR, R. M. N80-10244
N80-10336
TAYLOR, T. B. N80-10256
N80-10259
TAYLOR, W. W. L. N80-10277
TEBBETTS, I. N80-10083
TENENBEIN, A. N80-10851
TENG, E. F. S. N80-10360
TENNANT, R. A. N80-10227
TEPLITZ, V. L. N80-10082
TERRY, R. D. N80-10563
TETERIN, A. D. N80-10273
THODE, L. E. N80-10911
THOMAS, I. M. N80-10630
THOMAS, J. F., JR. N80-10346
THOMASON, S. B. N80-10456
THOMPSON, D. F. N80-10548
THOMPSON, T. W. N80-10986
THOMSEN, M. F. N80-10987
THORNBURG, D. D. N80-10163
TIGRANYAN, R. A. N80-10760
TIKHOMIROV, B. N80-10090
TINDAL, M. A. N80-10537
TISDALL, T. N80-10567
TOBIN, S. P. N80-10934
TODD, P. N80-10782
TOMAINE, R. L. N80-10136
TOMKINS, R. P. T. N80-10643
TOOHEY, R. E. N80-10829
TOPUNOV, A. M. N80-10090
TORMA-KRAJEWSKI, J. N80-10781
TRAINOR, W. L. N80-10824
TRAVIS, L. N80-10957
TREDWELL, T. J. N80-10934
TRIANNIS, J. N80-10698
TRILLING, G. H. N80-10869
TROITSKII, V. V. N80-10874
TROTT, W. M. N80-10333
TROUTBECK, D. N80-10360
TRUBACHEV, I. N. N80-10709
TRUNEVA, E. A. N80-10060
TRUONG, T. K. N80-10254
TSANG, J. S. K. N80-10922
TSAO, C. P. N80-10139
TSE, N. B. N80-10475
TSENG, H. F. N80-10431
TSO, F. K. W. N80-10527
TUCKER, T. R. N80-10520
TUNAKOV, A. P. N80-10083
TUNG, R. W. N80-10359
TURNER, E. R. N80-10331
TURNSHEK, D. A. N80-10978
TWOGOOD, R. E. N80-10827
TYLER, J. S. N80-10155
TZOU, K. T. S. N80-10465

U

UGLOVA, N. N. N80-10761
URAKEV, I. M. N80-10081
USTA, M. A. N80-10430

V

VAINDINER, A. A. N80-10976
VAN ALLEN, J. A. N80-10987
VANDHERENDONCK, A. J. N80-10160
N80-10162
VANWINKLE, W. N80-10930
VARADAN, V. K. N80-10861
VARADAN, V. V. N80-10861
VARFOLOMEEV, I. M. N80-10007
VARGANOV, I. S. N80-10863
VASILOS, T. N80-10318
VASILYEV, P. V. N80-10761
VATOLIN, V. V. N80-10037
VAUGH, R. S. N80-10179
VAZERI, F. N80-10412
VERHOEFF, J. N80-10629
VIETS, H. N80-10118
VIKTOROV, A. N. N80-10767
VINOGRADOV, R. S. N80-10001
N80-10002
N80-10061
VINOGRADOV, R. I. N80-10038
VOLKOV, A. B. N80-10042
VOLOSEVICH, P. P. N80-10915
VOLOV, V. T. N80-10025
N80-10085
VOLPI, A. N80-10311
VORONOV, S. A. N80-10478
VOROTELIN, Y. P. N80-10039
VYSHEDKEVICH, I. U. N80-10055

W

WACENSKIE, L. N80-10488
WAGNER, J. A. N80-10144
WAGNER, L. H. N80-10594
WAIDEL, R. Y. N80-10390
WAKALOPULOS, G. N80-10877
WAKAMIYA, W. N80-10382
WALBURN, F. J. N80-10473
WALSH, W. J. N80-10970
WALSKI, T. M. N80-10455
WALTER, J. L. N80-10510
WANG, K. K. G. N80-10833
WARMBRODT, W. N80-10516
WARNER, D. M. N80-10538
N80-10539
N80-10554
N80-10557
N80-10559
N80-10577
N80-10963
WARREN, G. D. N80-10371
WATERS, P. F. N80-10625
WATTS, R. L. N80-10312
WAWCH, R. C. N80-10216
WEBER, R. J. N80-10323
WEBSTER, R. P. N80-10527
WEED, R. A. N80-10700
WEI, I. W. N80-10519
WEI, R. P. N80-10432
WEI, Y. J. P. N80-10388
WEIB, A. N80-10791
WEIL, E. M. N80-10519
WEIR, T. W. N80-10515
WEISS, R. R. N80-10352
WEISS, W. D. N80-10444
WEISSENBURGER, D. W. N80-10695
WELLS, W. H. N80-10658
WENZLER, S. A.

WERSCHULZ, A. N80-10040
WESTBROOK, C. K. N80-10205
WESTON, R. C. N80-10194
WHETSTONE, W. D. N80-10514
WHINNERY, J. R. N80-10438
WHITLOW, J. B., JR. N80-10246
WHITTELY, D. C. N80-10132
WIDROW, B. N80-10419
WIFFEN, F. W. N80-10354
WILKINS, M. L. N80-10471
WILKINS, S. C. N80-10402
WILLIAMS, D. A. N80-10234
WILLIAMS, J. W. N80-10353
WILLIAMS, R. O. N80-10055
WILLIAMS, T. N80-10629
WILLIAMSON, R. R. N80-10390
WILLIAMSON, J. E. N80-10283
WILLIE, J. R. N80-10399
WILSON, D. L. N80-10284
WILSON, K. L. N80-10916
WINN, C. B. N80-10653
WIPF, S. L. N80-10443
WISE, J. L. N80-10451
WISEMAN, C. D. N80-10351
WITHERSPOON, J. T. N80-10167
WITTER, A. N80-10701
WOLF, R. A. N80-10712
WOLFE, R. W. N80-10579
WOLFINGER, T. F. N80-10629
WOLTERS, F. C. N80-10867
WOOD, C. A. N80-10541
WOOD, C. L. N80-10847
WOODBURY, G. R. N80-10685
WOOLARD, H. W. N80-10113
WRAY, W. O. N80-10649
WU, A. N80-10786
WU, R. J. C. N80-10468
WU, J. J. N80-10127
WU, S. T. N80-10635
WUENSCH, B. J. N80-10318
WUNSCH, A. N80-10188
WYNVEEN, R. A. N80-10800
N80-10801

Y

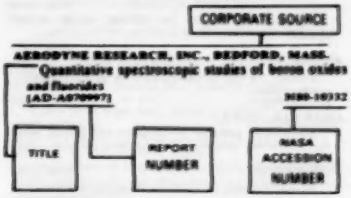
YAKOVLEV, V. P. N80-10006
YAKUNIN, V. V. N80-10023
YAKUSHEV, V. S. N80-10024
YAMADA, M. M. N80-10696
YANKOVSKII, V. M. N80-10065
N80-10075
YAUSHEV, R. A. N80-10007
YEGOROV, B. B. N80-10749
N80-10487
YENTSCH, C. S. N80-10566
N80-10569
YIP, L. P. N80-10135
YOUNG, N. E. N80-10794
YUNCK, T. P. N80-10247
YUNUSOV, F. S. N80-10023
YUNUSOV, N. K. N80-10037

Z

ZALOGUYEV, S. N. N80-10767
ZANOTTI, C. N80-10285
ZARUBINA, K. V. N80-10767
ZAZDNOV, A. N. N80-10477
ZDOROVSKAYA, B. I. N80-10772
ZEDAN, M. F. N80-10100
ZEIMETZ, K. A. N80-10400
ZEMSKOV, V. N80-10270
ZHIRMUNSKIY, A. V. N80-10996
ZHUIKOV, V. V. N80-10069
ZIIUK-OV, B. S. N80-10686
ZHURAVLEV, B. A. N80-10056
ZIEMIANSKI, J. A. N80-10206
ZIENKE, P. L. N80-10736
ZIMMER, H. N80-10104
ZINOVEV, N. P. N80-10023
ZIOCK, K. O. H. N80-10081
ZOELLNER, W. D. N80-10483
ZOLLARS, G. V. N80-10397
N80-10401
N80-10402
N80-10580
N80-10667
N80-10668
ZOLLER, C. J. N80-10158
N80-10176
ZUKASHVILI, G. G. N80-10915
ZWEMER, D. A. N80-10648

CORPORATE SOURCE INDEX

Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document cited (e.g., NASA report, translation, NASA contractor report). The NASA accession number denotes the number by which the citation is identified. The titles are arranged under each corporate source in ascending accession number order.

A

ADDIS TRANSLATIONS INTERNATIONAL, PORTOLA VALLEY, CALIF.

Electron transfer in a superdense nondegenerate plasma
[UCRL-TRANS-11473] N80-10924

ADVAND SYSTEMS ENGINEERING, SAN DIEGO, CALIF.

The GPS navigation message
N80-10160

GPS time
N80-10162

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, NEUILLY-SUR-SEINE (FRANCE).

Technical evaluation report on the fluid dynamics panel Symposium on High Angle of attack aerodynamics
[AGARD-AR-145] N80-10147

AGARD two-dimensional aeroelastic configurations
[AGARD-AR-156] N80-10202

Manoeuvre limitations of combat aircraft
[AGARD-AR-155A] N80-10203

Dynamic characteristics of flight simulator motion systems
[AGARD-AR-144] N80-10238

Technical evaluation report on the Propulsion and Energetics Panel 53rd Symposium on Solid Rocket Motor Technology
[AGARD-AR-151] N80-10280

Solid rocket motor technology
[AGARD-CP-259] N80-10281

Use of computer structural programs for the dynamic analysis of satellites structures
[AGARD-R-680] N80-10532

Human factors in the design and evaluation of aviation maps
[AGARD-AG-225] N80-10536

Fluid dynamic aspects of wind energy conversion
[AGARD-AG-243] N80-10683

Manual of documentation practices applicable to defence-aerospace scientific and technical information, volume 2
[AGARD-AG-235-VOL-2] N80-10961

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, PARIS (FRANCE).

Principles and operational aspects of precision position determination systems
[AGARD-AG-245] N80-10154

AERO SYSTEMS, INC., BOULDER, COLO.

Sierra cooperative pilot project, field
[PB-297065/5] N80-10741

AERODYNE RESEARCH, INC., BEDFORD, MASS.

Quantitative spectroscopic studies of boron oxides and fluorides
[AD-A070997] N80-10332

AEROJET LIQUID ROCKET CO., SACRAMENTO, CALIF.

Photographic combustion characterization of LOX/hydrocarbon type propellants
[NASA-CR-160318] N80-10178

AERONAUTICAL RESEARCH INST. OF SWEDEN, STOCKHOLM.

Investigation of the boundary condition at a wind tunnel test section wall for a lifting wing-body model at low supersonic speed
[AD-A072098] N80-10143

AEROSPACE CORP., EL SEGUNDO, CALIF.

Solid propellant specific impulse prediction
N80-10286

Measurements of anomalous dispersion of HF in absorption
[AD-A070844] N80-10331

Forced response of a Blasius flat-plate boundary layer to an external vortex street
[AD-A072466] N80-10462

AEROSPACE CORP., LOS ANGELES, CALIF.

Phase 2 GPS receiver design philosophy
N80-10171

A generalized solid motor development test approach with application to IUS
N80-10314

AEROSPACE MEDICAL DIV. AEROSPACE MEDICAL RESEARCH LABS. [6570TH], WRIGHT-PATTERSON AFB, OHIO.

Lexicon of aircraft transparency terms
[AD-A071399] N80-10200

AEROSPACE MEDICAL RESEARCH LABS., WRIGHT-PATTERSON AFB, OHIO.

Modality effects in scanning nonverbal information: Evidence for multiple memory codes
[AD-A072297] N80-10796

AIN SHAMS UNIV., CAIRO (EGYPT).

Structural pattern of the northern part of the eastern desert of Egypt
N80-10545

Photolineaments in the ASTP stereostrip of the western desert of Egypt
N80-10546

Utilization of ASTP photographs in the study of small structures in Abu Rawash and Wadi el Natrun, Egypt
N80-10547

East-West pervasive lineaments in central and southeastern Spain
N80-10549

Detection of a probable ancestral delta of the Nile River
N80-10571

AIR FORCE AERO PROPULSION LAB., WRIGHT-PATTERSON AFB, OHIO.

Experimental investigation of annular cascade performance
[AD-A072442] N80-10464

An improved FORTRAN reorganizer
[AD-A071334] N80-10822

AIR FORCE AVIONICS LAB., WRIGHT-PATTERSON AFB, OHIO.

Video control center and cockpit simulator
[AD-A071313] N80-10234

AIR FORCE FLIGHT DYNAMICS LAB., WRIGHT-PATTERSON AFB, OHIO.

Recent developments in ejector technology in the Air Force: An overview
N80-10108

Internal-external flow integration for a thin ejector-flapped wing section
N80-10113

Pressure and velocity measurements in a three-dimensional wall jet
N80-10126

Interface concerns of ejector integration in V/STOL aircraft
N80-10129

AIR FORCE HUMAN RESOURCES LAB., BROOKS AFB, TEX.

Advanced simulator for pilot training [ASPT]: G-seat optimization
[AD-A068475] N80-10233

Simulator for air-to-air combat motion system investigation
[AD-A072612] N80-10237

AIR FORCE INST. OF TECH., WRIGHT-PATTERSON AFB, OHIO.

Prediction of aerodynamic forces on a circular cylinder and thin airfoil in a transonic airstream by the finite element method
N80-10093

Some tests on small-scale rectangular thrust ejector
N80-10120

A study to develop optimization algorithms for aircraft wing structures
[AD-A072668] N80-10196

AIR FORCE MATERIALS LAB., WRIGHT-PATTERSON AFB, OHIO.

Quasi-static crack growth in metals at elevated temperature, a review
[AD-A072347] N80-10348

Thermogravimetric analysis of polymers in air
[AD-A070669] N80-10367

AIR FORCE ROCKET PROPULSION LAB., EDWARDS AFB, CALIF.

The use of standardized test motors and laboratory tools in the development of missile propulsion technology
N80-10315

X-ray spectroscopy as a diagnostic tool in solid propellant combustion flows
[AD-A070796] N80-10380

AIR FORCE WEAPONS LAB., KIRTLAND AFB, N. MEX.

On the rational design of compressible flow ejectors
N80-10114

Airblast vulnerability envelopes for supersonic aerospace vehicles
[AD-A072247] N80-10201

AIRESEARCH MFG. CO., PHOENIX, ARIZ.

Contact stress analysis of ceramic-to-metal interfaces
[AD-A072073] N80-10522

Brayton isotope power system, phase I
[TID-28927] N80-10615

ALABAMA UNIV., HUNTSVILLE.

Experimental and numerical studies of liquid storage tank thermal stratification for a solar energy system
[COO-4479-2] N80-10655

ALLERTON PRESS, INC., NEW YORK, N. Y.

Soviet aeronautics, volume 21, no. 3
N80-10001

Application of the gas flow dimensionless characteristics method for experimental study of sonic nozzles
N80-10002

Parametric method of aircraft engine status diagnostics based on limited information
N80-10003

Study of self-oscillatory liquid film flow regime in coaxial air stream
N80-10004

Dynamic characteristics of liquid film in hybrid hydrostatic bearing
N80-10005

Influence of gas turbine engine combustion chambers geometric parameters on mixture formation characteristics
N80-10006

On the study of heat transfer with the aid of a local heat flux sensor
N80-10007

On the question of selecting the characteristic quantity governing fuel self-ignition in a stream
N80-10008

Experimental study of the gasdynamic characteristics of a stator cascade with cooling air discharge through the vane surface
N80-10009

On the influence of liquid oscillations in fuel line on the head of a pump operating in regimes with reverse flow
N80-10010

Determination of turning angle of a jet impinging on a bucket with visor
N80-10011

Most rational linearization of nonlinear unsteady heat conduction problems
N80-10012

On the flame stabilization mechanism in two-phase fuel-air mixture flow
N80-10013

On the influence of relative pitch in the subsonic turbine cascade
N80-10014

Statistical optimization of structural thermal protection material thickness
N80-10015

Analytic design of complex systems, II
N80-10016

Analysis of flame stabilization conditions using the homogeneous reactor model
N80-10017

Experimental study of the turbulent wake downstream of a fan jet
N80-10018

Experimental study of turbulence energy balance components in the section of a retarded turbulent boundary layer
N80-10019

The turbulent boundary layer on a curvilinear surface
N80-10020

Correlation of experimental data on two-phase flow *heat transfer in convergent part of a nozzle*
N80-10021

Study of heat-pipe heat exchanger in the small gas turbine engine system
N80-10022

Mathematical models of the process of vibroabrasive grinding of parts with autonomous vibrations in the vibromachine container
N80-10023

Analytic representation of turbine characteristics in form convenient for computer calculation of GTE parameters
N80-10024

Study of radial diffusers with flow swirl
N80-10025

Experimental study of curvilinear surface film cooling effectiveness
N80-10026

Long-life GTE operation based on technical condition
N80-10027

Use of the method of variable directions for numerical study of the temperature states of a turbine disk with blades
N80-10028

Characteristics of afterburning bypass turbojet engine with oxygen injection into the afterburner chamber
N80-10029

Experimental determination of heat transfer coefficient when emptying gas vessels
N80-10030

Soviet Aeronautics, volume 21, no. 4
N80-10031

The inverse problem of control system guaranteed sensitivity
N80-10032

Mathematical model and stability of hydraulic servo drive with jet-throttle regulation
N80-10033

On stability of operation of Liquid Rocket Engine with Turbopump Assembly (TPA)
N80-10034

Analytic design of regulators for controlling elastic flight vehicle rotation about the longitudinal axis
N80-10035

On the laminar boundary on the surface of a cylinder moving in a fluid
N80-10036

Optimal control of flight vehicle with elastic elements
N80-10037

Analog modeling in studying supersonic flow *around a wing and its governing analog criteria*
N80-10038

Influence of initial deflections on buckling of cylindrical shells under creep conditions with combined action of axial compression and internal pressure
N80-10039

Field state estimation by least squares
N80-10040

Self-similar solutions in the destruction and melting problem with account for abrupt density change
N80-10041

Basic problem of aircraft gas turbine engine analytic design, part 1
N80-10042

Analysis of thin-wall beams by the method of segments
N80-10043

Selecting the geometric parameters and position of a *servo flap on the root profile of a swept wing using tunnel test data, part 2*
N80-10044

Laminar boundary layer calculation from experimental pressure distribution
N80-10045

On modeling sensitivity of a linear system to reduction of its order by the infinitesimal transformation method in the yaw motion control problem
N80-10046

On the empennage snap-through problem
N80-10047

Electrical charging of fabric and film materials
N80-10048

Propulsive nozzle electrification
N80-10049

Motion of rectangular wing between parallel walls
N80-10050

On minimizing integral quadratic estimates
N80-10051

Creep analysis of thin-wall structures subject to transient heating and loading
N80-10052

Structural analysis of variable-sweep wings
N80-10053

Determination of strain fields near concentrators *from strain gage indicators*
N80-10054

Stress-strain diagram approximation
N80-10055

Spectral analysis of surface irregularities and vibrations of "spid" system elements during burnishing operations
N80-10056

On thin-wall beam effective stiffness
N80-10057

Application of the factor interpolation method in *flight vehicle landing gear analytic design*
N80-10058

Parachute-rocket deceleration system design
N80-10059

Flow around small-aspect-ratio delta wing with vortex "bursting"
N80-10060

Soviet Aeronautics, volume 22, no. 1
N80-10061

Calculation of working process in slow-compression piston-type aerodynamic tube
N80-10062

Gas curtains in gas turbine engines
N80-10063

Heat transfer in turbulent gas flows with high-*frequency pressure oscillations*
N80-10064

Study of homogeneous combustion chamber temperature field nonuniformity with primary zone *parameter variation*
N80-10065

Measurement of liquid pump torque in the starting regime
N80-10066

Computer calculation of stationary temperature fields in air-cooled turbine rotor blades
N80-10067

Selection of optimal parameters of heat-pipe heat exchanger for a gas turbine engine
N80-10068

Computer calculation of stationary temperature fields in cooled turbine discs
N80-10069

Method for calculating optimal parameters of high-pressure pneumatic drives
N80-10070

Systematization of simple detail parts of regulable nozzle of gas turbine engine
N80-10071

Liquid ejector with perforated nozzle
N80-10072

Generalized heat and mass transfer law for internal flows
N80-10073

Dynamics of diesel fuel combustion in turbulent *flow*
N80-10074

Study of mass exchange between primary zone and secondary air jets in gas turbine engine combustion chambers
N80-10075

Approximate calculation of the laminar boundary *layer in micronozzles*
N80-10076

Aerodynamic efficiency of gas turbine intake duct
N80-10077

Centripetal turbine fabrication technology
N80-10078

Design of boundary-layer air intakes
N80-10079

Application of gradient method to study of heat transfer in axisymmetric channels of different configuration
N80-10080

Unloading the drive of gas distributor valves operating at high pressures
N80-10081

Application factor of two-dimensional transverse sonic jet interacting with supersonic stream
N80-10082

On the influence of short shroud platforms on turbine stage operation
N80-10083

Semi-empirical method for determining local heat *transfer coefficients for flow around a sphere*
N80-10084

Study of combined operation of self-evacuating vortex tube with diffuser
N80-10085

On axial turbine stage rotor blade twist with tangential tilt of the stator vanes
N80-10086

Warmup of LRE chambers with regenerative cooling
N80-10087

Study of size distribution of oil drops formed in GTE oil
N80-10088

Nonstationarity of heat transfer in axial turbine blading during engine startup
N80-10089

Laser Doppler Velocimeter (LDV) study of secon-*dary flows in turbine cascade*
N80-10090

Pneumatic distributor for turbojet engine control system
N80-10091

AMERICAN UNIV., WASHINGTON, D. C.

Studies on the photodegradation of poly (methyl methacrylate)
(PB-297793/2)
N80-10771

AMES LAB., IOWA.

Analysis of airborne particulates and human urine by inductively coupled plasma-atomic emission spectrometry
(PB-297775/9)
N80-10787

Special purpose computer to computer interface
(IS-T-830)
N80-10811

Analysis and computerized fitting of the lineshape of the NMR powder pattern
(IS-4516)
N80-10874

AMHERST COLL., MASS.

Evaluation of satellite images of the Levantine Rift zone
N80-10342

ANALYTICAL METHODS, INC., BELLEVUE, WASH.

Prediction of aerodynamic characteristics of fighter wings at high $\bar{M}$
(AD-A072630)
N80-10140

ANAMET LABS., INC., SAN CARLOS, CALIF.

Angular vibration of aircraft. Volume 1: Executive summary
(AD-A071895)
N80-10197

Angular vibration of aircraft. Volume 2: Prediction methods for angular vibration
(AD-A071749)
N80-10198

ANTHROPOLOGY RESEARCH PROJECT, YELLOW SPRINGS, OHIO.

Revised height/weight sizing programs for men's protective flight garments
(AD-A070732)
N80-10883

ARGONNE NATIONAL LAB., ILL.

Modulated structures in inorganic one-dimensional metals
(CONF-790341-7)
N80-10353

Mineral resources and land-use planning, the Watkins, Colorado case: A workshop synopsis
(ANL/LRP(TM-7)
N80-10385

Materials testing for central receiver solar-thermal power systems
(DOE/TIC-10103)
N80-10686

Modeling approach suitable for energy system
(CONF-790429-4)
N80-10432

Test problems for constrained nonlinear mathematical programming algorithms
(ANL-AMD-TM-320-REV-1)
N80-10820

User's guide to PLOTIN/MYPLOT. A general-purpose plotting routine for use with AMD graphics
(ANL/RER/78-3)
N80-10829

Telescoping beams for heavy ion fusion
(CONF-790527-100)
N80-10917

Power supply requirements for a tokamak fusion reactor
(ANL/FPP/TM-119)
N80-10918

Thermal conductivity of the helium-argon system
(ANL-79-3)
N80-10953

Electronic specific heats in metal-hydrogen systems
(CONF-790301-11)
N80-10954

ARIZONA STATE UNIV., TEMPE.

Volcanic landforms and atmoblemes
N80-10351

Feedback systems for image acquisition and processing
N80-10906

ARIZONA UNIV., TUCSON.

Diffraction dissociation of high energy proton on helium
(CONF-790826-10)
N80-10870

Proton-helium elastic scattering from 40 to 400 GeV
(CONF-790826-9)
N80-10871

ARMY CONSTRUCTION ENGINEERING RESEARCH LAB., CHAMPAIGN, ILL.

Fracture characteristics of structural steels, reference manual
(AD-A072154)
N80-10349

The building loads analysis and system thermodynamics blast program. Version 2.0: users manual, volume 2
(AD-A072273)
N80-10404

ARMY ELECTRONICS COMMAND, WHITE SANDS MISSILE RANGE, N. MEX.
The 19035D GSRS, missile number 1020, round number V-23
[AD-A070539] N80-10722
The 19702A GSRS, missile number 087, round number B-11
[AD-A070549] N80-10726
ARMY ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND, FORT BELVOIR, VA.
Physics of mesomorphic compounds
[AD-A070539] N80-10935
ARMY ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND, FORT MONMOUTH, N. J.
A performance evaluation of mini-laser cartridge devices
[AD-A072505] N80-10489
ARMY ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND, WHITE SANDS MISSILE RANGE, N. MEX.
Lance missile no. 4388, round no. 330 ACL
[AD-A071335] N80-10733
ARMY MATERIALS AND MECHANICS RESEARCH CENTER, WATERTOWN, MASS.
Illustrations of two simple methods of determining stress intensity factors from stress concentrations and stress distributions
[AD-A072199] N80-10521
ARMY MISSILE RESEARCH AND DEVELOPMENT COMMAND, REDSTONE ARSENAL, ALA.
Application of a microprogrammed, bit slice microprocessor to the real time imaging tracker problem
[AD-A071638] N80-10807
ARMY RESEARCH AND TECHNOLOGY LABS., HAMPTON, VA.
A flight investigation of performance and loads for a helicopter with NLR-1T main-rotor blade sections
[NASA-TM-80165] N80-10136
ARMY RESEARCH INST. FOR THE BEHAVIORAL AND SOCIAL SCIENCES, ARLINGTON, VA.
Training effectiveness of the CH-47 flight simulator
[AD-A072317] N80-10236
Effects of retrieval term specificity on information retrieval from computer-based intelligence systems
[AD-A072312] N80-10958
ARMY RESEARCH OFFICE, RESEARCH TRIANGLE PARK, N. C.
Electronics research in the Army
[AD-A071805] N80-10992
ARMY SATELLITE COMMUNICATIONS AGENCY, FORT MONMOUTH, N. J.
Project Aries: Users manual for Arian 2 and associated subsystems
[AD-A072471] N80-10818
ARMY TANK-AUTOMOTIVE SYSTEMS DEVELOPMENT CENTER, WARREN, MICH.
TARADCOM signal analysis program
[AD-A072014] N80-10817
ASSOCIATION OF BAY AREA GOVERNMENTS, BERKELEY, CALIF.
Example control strategy for ozone. Volume 2: Case study of the San Francisco Bay region, 1976-1978
[PB-297000/5] N80-10706
ATMOSPHERIC SCIENCES LAB., WHITE SANDS MISSILE RANGE, N. MEX.
The 19304D GSRS missile number 1026, round number v-25
[AD-A071425] N80-10720
The 19702A GSRS, missile no. 301, round B-10
[AD-A070707] N80-10721
The 19304D GSRS, missile number 1023, round number V-23
[AD-A070598] N80-10723
The 12823AT lance, missile number 3382, round number 327 ECL 8 March 1979
[AD-A070557] N80-10724
The 19702A GSRS, missile number N/A, round number B-4/B-7, 26 March 1979
[AD-A070556] N80-10725
The [FA] 19304 GSRS, missile number 1019, round number V-20
[AD-A070830] N80-10727
The 19702A GSRS, round numbers B-2 and B-3 21 February 1979
[AD-A070814] N80-10728
Evaluation of the passive remote crosswind sensor
[AD-A071176] N80-10730
The 12823A lance missile number 4724 round number 332 NCL
[AD-A072044] N80-10738
ATOMICS INTERNATIONAL, GOLDEN, COLO.
Quality assurance in alternative energy sources
[RHO-SA-107] N80-10504
AUBURN UNIV., ALA.
Non-rectangular mos field effect devices
N80-10429
AVCO-EVERETT RESEARCH LAB., MASS.
Turbulence environment characterization
[AD-A072379] N80-10736
AVCO SYSTEMS DIV., WILMINGTON, MASS.
Improving the stress rupture and creep of silicon nitride
[NASA-CR-159585] N80-10318
AXIOMATIX, LOS ANGELES, CALIF.
Shuttle orbiter Ku-band radar/communications system design evaluation: High gain antenna/wideband horn
[NASA-CR-160316] N80-10275

B

BATTELLE COLUMBUS LABS., OHIO.
Determination of constitutive equations for high strength Aluminum and Titanium alloys applicable to sheet metal formability
[AD-A072121] N80-10346
Sugar crops as a source of fuels. Volume 1: Agricultural research
[TID-29400/1] N80-10595
Spray nozzle designs for agricultural aviation applications
[NASA-CR-159782] N80-10460
BATTELLE PACIFIC NORTHWEST LABS., RICHLAND, WASH.
Assessment of synfuel transportation to year 2000
[PNL-2768] N80-10382
Summary report of the Solar Reflective Materials Technology Workshop
[PNL-2763] N80-10613
Methodology for identifying materials constraints to implementation of solar energy technologies
[PNL-2711] N80-10625
BAYERN-CHEMIE G.M.B.H., ASCHAU (WEST GERMANY).
Gas generator propellants for air-to-air missiles
N80-10297
BAYERN-CHEMIE G.M.B.H., OTTOBRUNN (WEST GERMANY).
Erosive and transient burning effects on performance prediction accuracy of tactical rockets
N80-10295
Material problems in jet vane thrust vector control systems
N80-10308
BDM CORP., MCLEAN, VA.
Coal conversion processes and analysis methodologies for synthetic fuels production
[NASA-CR-161322] N80-10379
BDM CORP., MONTEREY, CALIF.
Aircraft measurements of micrometeorological parameters at Panama City, Florida, in 1978
[AD-A070956] N80-10737
BENDIX CORP., KANSAS CITY, MO.
Electrical measurement of plating thickness
[BDX-613-1042-REV] N80-10442
BIGELOW LAB. FOR OCEAN SCIENCES, WEST BOOTHBAY HARBOR, MAINE.
Ocean color observations
N80-10566
Estimate of total reflectance from the Orinoco River outflow
N80-10569
BIONETICS CORP., HAMPTON, VA.
The potential of carbon fiber induced shock hazards in household toasters
[NASA-CR-159147] N80-10434
BOEING MILITARY AIRPLANE DEVELOPMENT, SEATTLE, WASH.
Numerical prediction of 3-D ejector flows
N80-10111
BOOZ-ALLEN AND HAMILTON, INC., BETHESDA, MD.
EPRI new energy resources department strategy paper
[EPRI-ER-979] N80-10610
BRITISH PETROLEUM OIL, INC., MARCUS HOOK, PA.
Treatment of refinery wastewater using a filtration-activated carbon system
[PB-295780/1] N80-10972
BROOKHAVEN NATIONAL LAB., UPTON, N. Y.
Improvement of wear-resistance properties of natural aggregates by materials impregnation
[BNL-25396] N80-10323
Hydrogen diffusion and trapping in bcc and fcc metals
[BNL-26132] N80-10356
AC superconducting cables
[BNL-26016] N80-10441
One-dimensional model of vapor generation in steady flashing flow
[BNL-NUREG-25616] N80-10468
Heat of vaporization spectrometer
[BNL-24973] N80-10480
Solar assisted heat pump overview and summary of in-house research
[BNL-24911] N80-10624
Dynamics and control: Energy conversion, delivery, and demand analysis
[BNL-26045] N80-10633
State of the art of sensible heat storage for solar heat pump systems
[BNL-25969] N80-10651
Compiling a multistate emissions inventory
[BNL-25843] N80-10681
One- and two-dimensional heating analyses of fission synfuel blankets
[BNL-NUREG-25635] N80-10922
Dependence of conduction band energy and electron mobility on fluid density
[BNL-26072] N80-10941
Effects of stoichiometry and neutron irradiation in superconducting A-15 compounds
[BNL-25968] N80-10944
BROWN UNIV., PROVIDENCE, R. I.
Murda fault zone and the opening of the Red Sea
N80-10541

C

CALGARY UNIV. [ALBERTA].
A simple apparatus for the experimental study of non-steady flow thrust-augmenter ejector configurations
N80-10125
CALIFORNIA INST. OF TECH., PASADENA.
Some measurements in synthetic turbulent boundary layers
N80-10095
Some problems of nonlinear waves in solid propellant rocket motors
N80-10101
Leading edge flutter of a supercavitating hydrofoil
N80-10403
Experimental investigation of first and second-sound shock waves in liquid helium II
N80-10451
Studies on the mixing in a density-stratified shear flow
N80-10454
Geologic analysis of ASTP photographs of parts of southern California
N80-10540
Variation of seismic source parameters and stress drop within a descending slab as revealed from body-wave pulse-width and amplitude analysis, part 1. A seismological investigation of the subduction mechanism of seismic ridges, part 2
N80-10710
Serrated apertures: Statistical diffraction theory and experiments
N80-10902
An attempt to produce both thick and thinned flowing superfluid films. 1: A study of the feasibility of verifying Lifshitz's theory of Van der Waals force for a metallic surface. 2: The electrohydrodynamic instability of the super-thick helium film
N80-10932
CALIFORNIA POLYTECHNIC STATE UNIV., SAN LUIS OBISPO.
Human vigilance investigation analysis of the pattern array test [further data analysis]
[UCRL-13891-3] N80-10798
CALIFORNIA STATE UNIV., LONG BEACH.
Prediction of unsteady turbulent boundary layers with flow reversal
[AD-A072548] N80-10463
CALIFORNIA UNIV., BERKELEY.
Joint services electronics program
[AD-A072076] N80-10438
CALIFORNIA UNIV., BERKELEY. LAWRENCE BERKELEY LAB.
Electromagnetic scattering by a two-dimensional inhomogeneity due to an oscillating magnetic dipole
[LBL-8275] N80-10424
Noise considerations in millimeter-wave spectrometers
[LBL-7294] N80-10483
Another look at energy conservation
[LBL-7093] N80-10611
Energy conservation and the environment: conflict or complement
[LBL-7022] N80-10621
Energy transfer in anisotropic systems. A: Excitation migration in substitutionally disordered one-dimensional solids. B: The spectroscopy of molecules absorbed on metal surfaces
[LBL-8332] N80-10648
Proceedings of the Third Berkeley Workshop on distributed data management and computer networks
[LBL-7953] N80-10831
Impact of storage rings on elementary particle physics
[LBL-6908] N80-10869
New particles, theoretical
[LBL-7977] N80-10887
Multipion production in nuclear collisions
[LBL-8758] N80-10894
Role of deep inelastic processes in nuclear physics: Experimental and theoretical aspects of deep inelastic reactions
[LBL-4936] N80-10895

CALIFORNIA UNIV., LIVERMORE. LAWRENCE LIVERMORE LAB.
Propellant driven turbulent interior ballistics and wall ignition
[UCRL-81209] N80-10279
Modeling of flame properties of methanol
[UCRL-82434] N80-10285
Emittance measurements on field emitter diodes
[UCRL-82533] N80-10040
Introduction to hydrodynamics
[UCID-18804] N80-10471
Development of an actively modelocked and Q-switched oscillator for laser fusion program at LLL
[UCRL-81365] N80-10490
Preliminary machining study on fluoroberyllate laser glass
[UCID-18201] N80-10493
Computer model for ductile fracture
[UCID-18070] N80-10526
Energy transition in California
[UCRL-15003] N80-10619
Methods of estimating the reliability of wind energy systems with storage
[UCRL-15005] N80-10623
Effect of mechanical energy storage systems on the characteristics of electric vehicles
[UCRL-82710] N80-10654
The impact of LNG spills on the environment: A comparison of dispersion models and experimental data
[UCRL-81812] N80-10688
Stratospheric H2O
[UCRL-82542] N80-10717
Human vigilance investigation analysis of the pattern array test [further data analysis]
[UCRL-13091-3] N80-10798
Algorithm for enhancing low-contrast details in digital images
[UCID-18015] N80-10827
Proceedings of AESOP-SCIE symposium on advanced computing
[CONF-781061-P2] N80-10846
High temperature science: Future needs and anticipated development in high-density shock-wave research
[UCID-18072] N80-10857
Magnetic order in gold-iron alloys
[UCRL-52634] N80-10942
Energy storage systems for automobile propulsion, 1978 study. 1: Overview and findings
[UCRL-52553-VOL-1] N80-10970

CALIFORNIA UNIV., LIVERMORE. LAWRENCE RADIATION LAB.
High peak power pulsed WIP electron gun
[UCRL-13950] N80-10877

CALIFORNIA UNIV., LOS ANGELES.
Two-dimensional flow past convex and concave corners at transonic speed and two-dimensional flow around a parabolic arc at subsonic and transonic speeds
N80-10092
Alternate constellations for the global positioning system
N80-10177
On the optimal selection of satellites in GPS
N80-10178
Method of conjugate gradients for optimal control problems with state variable constraints
[AD-A072258] N80-10227
Maximum likelihood identification of linear discrete stochastic systems
[AD-A072147] N80-10229
Error control systems for multi-access communication channels
N80-10409
Communication network synchronization in the presence of noise
N80-10411
The design of an optimal observer for linear discrete time dynamical systems
[AD-A072866] N80-10422
A theory and an algorithm for analog circuit fault diagnosis
N80-10426
Theory, analysis, and design of a new type of stripfed slot array
N80-10427
The extended Kalman filter as pulmonary blood flow estimator
N80-10779
Lunar crustal magnetic anomalies detected by the Apollo subsatellite magnetometers
N80-10985

CALIFORNIA UNIV., SAN DIEGO.
An experimental study of optical phase fluctuations in a random refractive field
N80-10905
Magnetic and superconducting transitions in the rare earth rhodium boride compounds
N80-10927

CALIFORNIA UNIV., SAN DIEGO, LA JOLLA.
A study of complex learning theory and methodologies
[AD-A068323] N80-10792

CALIFORNIA UNIV., SANTA BARBARA.
A low velocity water tunnel for biological research
N80-10271
Digital reconstruction of acoustic holograms
N80-10475

CALIFORNIA UNIV., SANTA CRUZ.
The design and verification of an operating system kernel
[AD-A072532] N80-10819

CARNEGIE-MELLON UNIV., PITTSBURGH, PA.
Set covering algorithms using cutting planes, heuristics, and subgradient optimization: A computational study
[AD-A072458] N80-10820
Cutting planes from conditional bounds: A new approach to set covering
[AD-A072479] N80-10821
A restricted lagrangean approach to the traveling salesman problem
[AD-A072457] N80-10837

CARRIER CORP., SYRACUSE, N. Y.
Development of a high temperature solar powered water chiller. Volume 3: Phase I
[SAN-1598-1/3-VOL-3] N80-10654

CENTRE DE RECHERCHES DU BOUCHET, VERT DE PETIT (FRANCE).
Improving the all weather ballistic and mechanical properties of smokeless propergols
N80-10308

CINCINNATI UNIV., OHIO.
Calculation of optimal coordinates for two-dimensional incompressible flow
N80-10894
Integral solutions of the high Reynolds number small separation problem
N80-10899

CITY UNIV. OF NEW YORK, N. Y.
Evoked cortical potentials and information processing
[AD-A070789] N80-10794

CIVIL AEROMEDICAL INST., OKLAHOMA CITY, OKLA.
Pilot performance during simulated approaches and landings made with various computer-generated visual glidepath indicators
[AD-A066220] N80-10131
The development of the ATC selection battery: A new procedure to make maximum use of available information when correcting correlations for restriction in range due to selection
[AD-A066132] N80-10798

CIVIL AND ENVIRONMENTAL ENGINEERING DEVELOPMENT OFFICE, TYNDALL AFB, FLA.
A literature search and review of the dynamics of aircraft-surface interaction
[AD-A070940] N80-10199

CLEAN WATER FUND, WASHINGTON, D. C.
Critical research needs in community water management
[PB-297804/9] N80-10973

COAST GUARD RESEARCH AND DEVELOPMENT CENTER, GROTON, CONN.
Long-term tracking of artic icebergs
[AD-A072473] N80-10583

COHEN (NORMAN) PROFESSIONAL SERVICES, REDLANDS, CALIF.
Composite propellant burn rate modeling
N80-10292

COLORADO STATE UNIV., FORT COLLINS.
Cluster analysis based on density estimates and its application to hardest imagery
N80-10533
A thermal vegetation canopy model of sensor response
N80-10535
Analysis of a LiCl open-cycle absorption air conditioner which utilizes a packed bed for regeneration of the absorbent solution driven by solar heated air
[COO-4546-1] N80-10652
Preliminary analysis of a total solar heating system
[COO-4546-4] N80-10653
Solar generation of industrial steam. Innovative research program subtask
[COO-4546-9] N80-10656
Generating covariance sequences and the calculation of quantization and rounding error variances in digital filters
[AD-A072877] N80-10838
Measurements of thermal conductivity of bcc He-3 at very low temperatures
N80-10929

COLORADO UNIV. AT BOULDER.
Transient phenomena in thermal explosion of confined gases
N80-10773
Nonlinear inelastic stability of flexibly-connected plane steel frames
N80-10508
Semiclassical quantization of Nonseparable Hamiltonian Systems
N80-10865

COLUMBIA UNIV., NEW YORK.
Research investigation directed toward extending the useful range of the electromagnetic spectrum
[AD-A071664] N80-10421

COLUMBIA UNIV. TEACHERS COLL., NEW YORK.
Satellite direct broadcasting: The prospects for development
N80-10410

COMBUSTION ENGINEERING, INC., WINDSOR, CONN.
MDAC/Rocketdyne solar receiver: Design review
[SAND-78-8188] N80-10616

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION [U. S. SENATE].
NASA authorization for fiscal year 1980. Part 4: Index
[GPO-51-336] N80-10964

COMMITTEE ON SCIENCE AND TECHNOLOGY [U. S. HOUSE].
Oversight: Space shuttle cost, performance, and schedule review
[GPO-50-365] N80-10274
Passive solar energy programs and plans
[GPO-36-211] N80-10599

COMPUTER GENETICS CORP., WAKEFIELD, MASS.
Remote sensing of LNG spill vapor dispersion using Raman LIDAR
[UCRL-13904] N80-10689

CONNECTICUT UNIV., STORRS.
Electron-dislocation interaction at low temperatures
[COO-2305-6] N80-10943

CORNELL UNIV., ITHACA, N. Y.
Effects of truncation in modal representations of thermal convection
[NASA-CR-162251] N80-10457
Rectification at N-N GaAS: [Ga, Al]As heterojunctions
[AD-A071732] N80-10937
Rectification at nGaAs - n Ga.7Al.3As heterojunctions grown by LPE
[AD-A071733] N80-10938
Stellar convection 2: A multi-mode numerical solution for convection in spheres
[NASA-CR-162252] N80-10979
Stellar convection 3: Convection at large Rayleigh numbers
[NASA-CR-162253] N80-10980

CRYSTAL SYSTEMS, INC., SALEM, MASS.
Silicon ingot casting heat exchanger method, multiwire slicing, fixed abrasive slicing technique, phase 3
[NASA-CR-162398] N80-10398

D

DAYTON UNIV., OHIO.
Collapse load analysis for plates and shells
[AD-A071649] N80-10518

DAYTON UNIV. RESEARCH INST., OHIO.
The Martin-Lomax iteration for the computations of transonic flow fields: Some observations
[AD-A072523] N80-10141

DE HAVILLAND AIRCRAFT CO. OF CANADA LTD., OTTAWA [ONTARIO].
The external augmentor concept for V/STOL aircraft
N80-10132

DECISION FOCUS, INC., PALO ALTO, CALIF.
Proposed research planning format for the Environmental Assessment Department
[EPRI-EA-1018] N80-10692

DEFENCE RESEARCH ESTABLISHMENT VALCARTIER [QUEBEC].
Nonlinear combustion instability in solid propellant rocket motors: Influence of geometry and propellant formulation
N80-10386

DEFENSE MAPPING AGENCY AEROSPACE CENTER, ST. LOUIS, MO.
Photogrammetric analysis of ASTP earth observations experiment data
N80-10581

DELAWARE UNIV., NEWARK.
Multiple steady states of the oxidation of carbon monoxide on a supported platinum catalyst
N80-10327
The use of satellites in environmental monitoring of coastal waters
[NASA-CR-162409] N80-10687

DELCO ELECTRONICS, SANTA BARBARA, CALIF.
Electromechanical flight control actuator
[NASA-CR-160348] N80-10224

DENVER UNIV., COLO.
Construction of well-conditioned systems for Fredholm I problems by mesh adapting
[COO-2402-10] N80-10845

DEPARTMENT OF ENERGY, MORGANTOWN, W. VA.
Fluidized-bed combustion of high sulfur coals
[METC/RI-79/4] N80-10386

DEPARTMENT OF ENERGY, OAK RIDGE, TENN.
Energy information data base. Corporate author entries
[DOE/TIC-4585-R1-SUPPL-1] N80-10617

DEPARTMENT OF ENERGY, WASHINGTON, D. C.
Economic structure, aggregate production functions and the demand for energy as an intermediate product: A preliminary analysis
[DOE/EIA-0103/5] N80-10607
National energy plan 2
[DOE/TIC-10100] N80-10618
Energy supply and demand in the midterm: 1985, 1990, and 1995
[DOE/EIA-0102/52] N80-10620
Comprehensive environment, health, and safety program report, FY 1978
[DOE/EV-0035] N80-10630
Environmental readiness of emerging energy technologies
[DOE/ERD-0022] N80-10631
Summary of major energy legislation of the 95th Congress
[DOE/TIC-10118] N80-10644
Waste Heat Utilization: Proceedings of 1978 Engineering Foundation Conference
[CONF-7808102] N80-10665
DEPARTMENT OF JUSTICE, WASHINGTON, D.C.
Computer systems conversion: A management perspective
[PB-297004/1] N80-10832
DESMATICS, INC., STATE COLLEGE, PA.
An examination of statistical impact acceleration injury prediction models based on torque and force variables
[AD-A074625] N80-10746
DEUTSCHE VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, AACHEN [WEST GERMANY].
Development of an air heater for a mixture formation test rig
[RAE-TRANS-2012] N80-10232
DOUGLAS AIRCRAFT CO., INC., LONG BEACH, CALIF.
An efficient user-oriented method for calculating compressible flow in an about three-dimensional inlets
[NASA-CR-159578] N80-10134
Cargo Logistics Airlift Systems Study [CLASS]. Volume 4: Future requirements of dedicated freighter aircraft to year 2000
[NASA-CR-158950-VOL-4] N80-10149
DRAPER [CHARLES STARK] LAB., INC., CAMBRIDGE, MASS.
Integration of GPS with inertial navigation systems
N80-10173
DREXEL UNIV., PHILADELPHIA, PA.
Optimal control of distributed parameter systems for solar thermal applications
N80-10593
DU PONT DE NEMOURS [E. I.] AND CO., AIKEN, S. C.
Experimental joule-heated ceramic melter for converting radioactive waste to glass
[DP-MS-78-59] N80-10688
DUVVURI RESEARCH ASSOCIATES, CHULA VISTA, CALIF.
Integration of ejectors into high-speed aircraft
N80-10119
DYNAMICS TECHNOLOGY, INC., TORRANCE, CALIF.
Re-establishment of laminar flow on a Heated Submerged Vehicle
[AD-A072566] N80-10063
DYNAMIT NOBEL A.G., COLOGNE [WEST GERMANY].
Internal ballistic problems of Helmut highly accelerated solid propellant rockets
N80-10288
DYNAMIT NOBEL A.G., TROISDORF [WEST GERMANY].
Propellant igniter development problems
N80-10289

E

EASTMAN KODAK CO., ROCHESTER, N. Y.
Spectral radiometric measurement and analysis program. Volume 2: Description of the data collection program
[AD-A072079] N80-10731
EBASCO SERVICES, INC., NEW YORK.
Applications survey: evaluation of gas turbine needs
[EPRI-AF-911] N80-10498
ECON, INC., PRINCETON, N. J.
The requirements and feasibility of business planning in the office of space and terrestrial applications
[NASA-CR-162388] N80-10852
A study of the cost-effective markets for new technology agricultural aircraft
[NASA-CR-159090] N80-10962
ECONOMICS, STATISTICS AND COOPERATIVES SERVICE, WASHINGTON, D. C.
Growing energy: Land for biomass farms
[PB-296650/5] N80-10410
ENERGY RESEARCH CORP., DANBURY, CONN.
Technology development for phosphoric acid fuel cell powerplant, phase 2
[NASA-CR-159705] N80-10603
ENGINEERING INFORMATION SYSTEMS, INC., SAN JOSE, CALIF.
User's guide: SPAR processor MN analysis of inelastic three-dimensional solids, part 2
[NASA-CR-161321] N80-10514
ENGINEERING SCIENCES DATA UNIT, LONDON [ENGLAND].
Wing-body yawing moment and sideforce derivatives due to sideslip: Nv and Yv
[ESDU-79006] N80-10097
Fatigue crack propagation in high alloy and corrosion resistant [stainless] steel plate, bar and forgings
[ESDU-79003] N80-10341
Equilibrium temperatures in self-contained bearing assemblies. Part 2: First approximation to temperature rise
[ESDU-78027] N80-10495
ENVIRONMENTAL DEFENSE FUND, INC., DENVER, COLO.
Use of Apollo-Soyuz photographs in coastal studies
N80-10573
ENVIRONMENTAL PROTECTION AGENCY, KANSAS CITY, MO.
Municipal Wastewater Treatment Facility, winter 1978
[PB-296813/9] N80-10974
ENVIRONMENTAL RESEARCH AND TECHNOLOGY, INC., CONCORD, MASS.
Snow hydrology studies
N80-10575
Meteorological data analysis in support of the ABRES Program
[AD-A070946] N80-10729
EQUITABLE ENVIRONMENTAL HEALTH, INC., PARK RIDGE, ILL.
The economic impact of proposed regulations to reduce particulate emissions from steel mills and industrial fugitive sources, E78-11
[PB-296527/5] N80-10705
ESCHER TECHNOLOGY ASSOCIATES, ST. JOHNS, MICH.
Survey of liquid hydrogen con..iner techniques for highway vehicle fuel system applications
[HCP/M2752-01] N80-10383

F

FEDERAL AVIATION ADMINISTRATION, WASHINGTON, D. C.
IFR aircraft handled forecast by air route traffic control center, fiscal years 1979-1990
[AD-A070786] N80-10153
FERMI NATIONAL ACCELERATOR LAB., BATAVIA, ILL.
Diffraction dissociation of high energy proton on helium
[CONF-780826-10] N80-10870
Proton-helium elastic scattering from 40 to 400 GeV
[CONF-780826-9] N80-10871
FLEET WEATHER CENTRAL/JOINT TYPHOON WARNING CENTER, FPO SAN FRANCISCO, CALIF. 96630.
Typhoon report, 1978
[AD-A070904] N80-10732
FLIGHT DYNAMICS RESEARCH CORP., VAN NUYS, CALIF.
Considerations of some critical ejector problems
N80-10127
FLORIDA ATLANTIC UNIV., BOCA RATON.
Fatigue and corrosion fatigue of HY-80 steel, as applicable to anchor bolt failures
[AD-A072067] N80-10350
FLORIDA STATE UNIV., TALLAHASSEE.
Limit distributions of Kolmogorov-Smirnov type statistics under a fixed alternative with estimated location and scale parameters
[AD-A072159] N80-10847
On rates of convergence in the L2 norm of nonparametric probability density estimates
[AD-A072134] N80-10848
Convergence rate for the mean integrated squared errors of some nonparametric density estimators of recursive delta-function type
[AD-A072133] N80-10849
A variation on Scheffe's theorm with application to nonparametric density estimation
[AD-A072132] N80-10850
General relativistic gravitation as the theory of broken symmetry of intransitive groups of transformations
[SLAC-PUB-2167] N80-10856
FLORIDA UNIV., GAINESVILLE.
The relationships of the process variables and material properties on clad-rolled metals
N80-10343
Study of the optimum charge-transfer image sensor
N80-10431

G

GCA CORP., BEDFORD, MASS.
Fabric filter model sensitivity analysis
[PB-297755/1] N80-10704
GENERAL ACCOUNTING OFFICE, WASHINGTON, D. C.
Energy saving strategies for federal procurement
[PB-296969/9] N80-10678
Natural gas reserves estimates: A good federal program emerging, but problems and duplications persist
[PB-296628/7] N80-10679
GENERAL DYNAMICS/ELECTRONICS, SAN DIEGO, CALIF.
Master control station
N80-10163
GPS master control station operations
N80-10164
Monitor stations
N80-10165
Ephemeris and clock determination in GPS
N80-10168
GENERAL DYNAMICS/ELECTRONICS, VANDENBURG AFB, CALIF.
The GPS upload station
N80-10166
GENERAL ELECTRIC CO., ARLINGTON, VA.
Identification and validation of quantitative measures of the psychological complexity of software
[AD-A072547] N80-10825
GENERAL ELECTRIC CO., SCHENECTADY, N. Y.
Investigation of microtubular ceramic structures
[AD-A072144] N80-10369
The first small power system experiment, Phase 1: Engineering experiment no. 1
[NASA-CR-162417] N80-10596
Conceptual design of thermal energy storage systems for near-term electric utility applications. Volume 2: Appendixes, screening of concepts
[NASA-CR-159411] N80-10622
GEO-ATMOSPHERICS CORP., LINCOLN, MASS.
Sensitivity study of CFAS and CFAR objective analysis techniques
[AD-A071452] N80-10734
GEOLOGICAL SURVEY, FLAGSTAFF, ARIZ.
Dunes and other windforms of central Australia, and a comparison with linear dunes on the Moenkopi Plateau, Arizona
N80-10560
GEORGE WASHINGTON UNIV., WASHINGTON, D. C.
Nonsteady-flow thrust augmenting ejectors
N80-10117
Regional geochemical exploration for mineral deposits in the appalachians of central and northwestern Virginia
N80-10534
GEORGIA INST. OF TECH., ATLANTA.
Combustion of aluminum in solid propellant flames
N80-10295
Heuristics for determining equivalence of program mutations
[AD-A071795] N80-10816
GEORGIA MARINE SCIENCE CENTER, SAVANNAH.
Hydrographic observations in the Georgia Bight, July 1977
[PB-297135/6] N80-10742
GEORGIA UNIV., ATHENS.
Subgroup report on alternative technology strategies for the isolation of nuclear waste
[TID-28818] N80-10885
GILBERT [GLEN A.] AND ASSOCIATES, WASHINGTON, D. C.
Civil applications of NAVSTAR GPS
N80-10175
GOSUDARSTVENNYI KOMITET PO ISPOLZOVANIYU ATOMNOI ENERGII, MOSCOW [USSR].
Study of a tokamak cleaning method utilizing glow discharge
[ORNL-TR-4664] N80-10921
GRUMMAN AEROSPACE CORP., BETHPAGE, N.Y.
Flying qualities research for highly augmented aircraft
[RE-582] N80-10194
The jet membrane process for uranium separation and enrichment
[RE-586] N80-10329
The relationship between excitation intensity and photochromic glass kinetics
[PM-692] N80-10362
Minimum cost transmitter-receiver antenna pairs
[RM-698] N80-10414

H

HANFORD ENGINEERING DEVELOPMENT LAB., RICHLAND, WASH.
Acid digestion of combustible waste
[HEDL-TME-78-77] N80-10614
HAWAII AD HOC COMMITTEE ON REMOTE SENSING, HONOLULU.
LANDSAT project, State of Hawaii: A preliminary report
[PB-296712/3] N80-10587

HAWAII INST. OF MARINE BIOLOGY, HONOLULU.
Metabolic responses of shallow tropical benthic microcosm communities to perturbation
[PB-298243/7] N80-10744

HAWAII UNIV., HONOLULU.
Asymptotic freedom without guilt
[UH-511-329-79] N80-10952

HERCULES, INC., MCGREGOR, TEX.
Solid rocket motor design automation technology
N80-10283

HONEYWELL, INC., MINNEAPOLIS, MINN.
Octahjore national monument visitor center solar heating and cooling system design review data
[NASA-CR-158796] N80-10601
Solar heating and cooling systems design and development
[NASA-CR-158618] N80-10602
Cost-effective control systems for solar heating and cooling applications
[SAN-1593-1] N80-10670

HONEYWELL ELECTRO-OPTICS CENTER, LEXINGTON, MASS.
Minority carrier lifetime and diffusion length in P-type mercury cadmium telluride
[AD-A071094] N80-10934

HONEYWELL SYSTEMS AND RESEARCH CENTER, MINNEAPOLIS, MINN.
Fiber optics transmitter integrated circuit development
[AD-A071437] N80-10909

HOUSTON UNIV., TEX.
Flow around axisymmetric bodies: The direct and inverse problems
N80-10100
Fischer-Tropsch synthesis over nickel catalysts
N80-10326
Electromagnetic fields of underground antennas
N80-10412
Design and evaluation of decentralized filters for large scale interconnected systems
N80-10425
Frequency-domain approaches to linear multivariable control systems designs
N80-10432
On the consistency of the maximum likelihood estimate of normal mixture parameters for a sample with field structure
[NASA-CR-160552] N80-10836

HUGHES AIRCRAFT CO., FULLERTON, CALIF.
Command and control terminals
N80-10185

HUGHES RESEARCH LABS., MALIBU, CALIF.
Optical-microwave interactions in semiconductor devices
[AD-A072539] N80-10487

HUMAN FACTORS RESEARCH, INC., GOLETA, CALIF.
Research on the psychophysiological basis of human vigilance
[AD-A068562] N80-10790

I

IBM FEDERAL SYSTEMS DIV., OWEGO, N. Y.
JTIDS expendable/low cost terminal development
N80-10187

IBM RESEARCH LAB., YORKTOWN HEIGHTS, N. Y.
Nonlinear spectroscopy
[AD-A071282] N80-10334

IDAHO NATIONAL ENGINEERING LAB., IDAHO FALLS.
Measurement of phase velocities in mist flows using stagnation probes
[NUREG-CR-0648] N80-10469
High temperature tungsten-rhenium thermocouples with molybdenum-rhenium sheaths
[TFBP-TR-285] N80-10482
Improved RELAP4 jet pump model
[CAAP-TR-046] N80-10500
Overview of geothermal energy in the United States
[CONF-790530-1] N80-10661
Application of microwave energy to post-calcination treatment of high-level nuclear wastes
[ICP-1183] N80-10889

ILLINOIS UNIV. AT CHICAGO CIRCLE, CHICAGO.
Microscopic classical equations of motion calculations of high-energy heavy-ion collisions
N80-10880

ILLINOIS UNIV. AT URBANA-CHAMPAIGN.
Preparation and characterization of polymer-bound polydentate amines
[AD-A071150] N80-10364
Chemiluminescence of diphenyl peroxide. Pulsed laser spectrophotometric detection of radical ion intermediates on the CIEEL path
[AD-A071151] N80-10486
Rinchao Ring, Brazil: A possible meteorite crater discovered by the Apollo astronauts
N80-10552
Modeling the impacts of transportation systems management on vehicle emissions, phase 1
[PB-296988/7] N80-10697

ILLINOIS UNIV., URBANA.
Longitudinal joint systems in slip-formed rigid pavements. Volume 1: Literature survey and field inspection
[AD-A066320] N80-10230
Growth of bismuth tungstate single crystals
[COO-1198-1261] N80-10940

IMPERIAL METAL INDUSTRIES LTD., KIDDERMINSTER (ENGLAND).
The suppression of combustion instability by particulate damping in smokeless solid propellant motors
N80-10307

INDIANA UNIV., BLOOMINGTON.
Intermediate energy, inelastic, and charge exchange nucleon-nucleus scattering
N80-10879

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The ageing behaviour of solid rocket propellants regarding their mechanical properties
N80-10299

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[FE-2489-33] N80-10990
Development of gas turbine fuels and combustion; An overview
[CONF-790337-4] N80-10991
Coal conversion systems: Technical data book
[HCP/T2206-01] N80-10992

INTERNATIONAL BUSINESS MACHINES CORP., HUNTSVILLE, ALA.
Solar energy system performance evaluation: A-Frame Industries, single family dwelling, Kaneohe, Hawaii
[SOLAR/1010-78/14] N80-10659

IOWA UNIV., IOWA CITY.
A correlation between auroral kilometric radiation and inverted-V electron precipitation
[NASA-CR-162399] N80-10713
Saturn's magnetosphere, rings, and inner satellites
[U-OF-IOWA-79-44] N80-10987

ITT AEROSPACE/OPTICAL DIV., FORT WAYNE, IND.
Study of a stereo electro-optical tracker system for the measurement of model deformations at the national transonic facility
[NASA-CR-159146] N80-10476

ITT AVIONICS, NUTLEY, N.J.
JTIDS: The issue of frequency selection
N80-10183
Distributed TDMA: An approach to JTIDS phase 2
N80-10189
JTIDS II/DTDMA - command and control terminals
N80-10190
JTIDS II/DTDMA tactical terminal
N80-10191

J

JET PROPULSION LAB., CALIF. INST. OF TECH., PASADENA.
Large-scale turbulent structures in jets and in flows over cavities and their relationship to entrainment and mixing
N80-10123
The deep space network
[NASA-CR-162414] N80-10240
Network functions and facilities
N80-10241
Voyager support
N80-10242
Pioneer 11 saturn encounter support
N80-10243
Radio astronomy
N80-10244
A voltage-controlled optical radio frequency-phase shifter
N80-10245
A point design for a gyrotron traveling wave tube amplifier
N80-10246
Demonstration of remote clock monitoring by VLBI, with three baseline closure
N80-10247
Projected state-of-the-art for frequency standards for the DSN in the 1982 - 1990 time frame
N80-10248
The R sub 0 parameter for optical communication using photon counting
N80-10249
Density and reliability predictions for a general logic structure for custom LSI
N80-10250
Frequency down-converters as applied to VLBI
N80-10251
The NOCC radio science subsystem: System performance validation for the DSN radio science and Very Long Baseline Interferometry [VLBI] systems
N80-10252
Design of a quick-look decoder for the DSN [7,1/2] convolutional code
N80-10253
A Reed-Solomon decding program for correcting both errors and erasures
N80-10254
DSN tracking system uplink frequency control
N80-10255
DSN CONSCAN: A vector nomenclature and method for determining parameter values
N80-10256
Antenna azimuth bearing model experiment
N80-10257
Radio frequency performance of DSS 14 64-m antenna at X-band using a dual hybrid mode feed
N80-10258
An experimental investigation of the effects of antenna pointing errors on range delays
N80-10259
S-band ultralow-noise traveling-wave maser
N80-10260
An improvement in Fourier transform accuracy
N80-10261
DSS receiver thermal noise model comparisons
N80-10262
Deep space network feasibility study of terminating Southern California Edison electrical service to Goldstone
N80-10263
X-band sampling by the occultation data assembly
N80-10264
Molten salt pyrolysis of latex
[NASA-CASE-NPO-14315-1] N80-10361
Start up system for hydrogen generator used with an internal combustion engine
[NASA-CASE-NPO-13849-1] N80-10374
Continuous coal processing method and means
[NASA-CASE-NPO-13758-2] N80-10377
System for detecting substructure microfractures and method therefore
[NASA-CASE-NPO-14192-1] N80-10387
Silicon ingot casting heat exchanger method, multi-wire slicing, fixed abrasive slicing technique, phase 3
[NASA-CR-162398] N80-10398
Borehole geological assessment
[NASA-CASE-NPO-14231-1] N80-10709

JOHNS HOPKINS UNIV., BALTIMORE, MD.
Coagulation rates of sub-micron particulates in the troposphere
[PB-295756/1] N80-10695

JOHNS HOPKINS UNIV., LAUREL, MD.
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[NASA-CR-3187] N80-10103

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[CONF-780826-10] N80-10870
Proton-helium elastic scattering from 40 to 400 GeV
[CONF-780826-9] N80-10871

JOINT PUBLICATIONS RESEARCH SERVICE, ARLINGTON, VA.
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[JPRS-74125] N80-10269
Alloys obtained in a state of weightlessness
N80-10270
USSR Report: Biomedical and Behavioral Sciences, no. 122
[JPRS-74365] N80-10748
Problems of pharmacology in space medicine
N80-10749
A portable stand for assessing the dynamics of a working individual's functional state
N80-10750
Filters for collection of chemical aerosol and fume samples from the air
N80-10751
USSR Report: Space Biology and Aerospace Medicine, volume 13, no. 5, 1979
[JPRS-74470] N80-10752
Current conceptions on the genesis of vestibulovegetative disorders in weightlessness
N80-10753
Effect of hypoxia on fluid-electrolyte metabolism and renal function in man as related to different degrees of motor activity
N80-10754
Possibility of using bone conduction in aviation radio communication
N80-10755
Speech illusions and significance thereof to aerospace practice
N80-10756
Age-related distinctions of changes in psychophysiological functions of pilots in the civil aviation under the influence of vibration and noise
N80-10757

Dietary supplements used to prevent some changes in the human body in the presence of nervous and emotional stress
N80-10758

Roentgenological examination of the human heart after 100-day hypokinesia
N80-10759

Effect of space flight conditions on deoxyribonucleoprotein and nucleic acid content of rat tissues
N80-10760

Reactions of rats to overheating following prolonged hypokinesia
N80-10761

Effect of hypokinesia on higher nervous activity of albino rats
N80-10762

The combined effect of carbon monoxide and hypokinesia
N80-10763

Levels and proportion of RNA and proteins in the system of the neuron: Vestibular nuclear neuroglia and cerebellum during hypokinesia
N80-10764

Some hemodynamic parameters during respiration of oxygen under excessive pressure
N80-10765

Bichromate oxidability as a criterion of quantitative levels of organic impurities in reclaimed water
N80-10766

Amount of microorganisms discharged from the upper respiratory tract and integument of people confined in a sealed chamber
N80-10767

Ultrastructural changes in canine hepatocytes during continuous chronic exposure to low doses of gamma radiation
N80-10768

Rush nuts [Cyperus esculentus] as a source of vegetable oil in a closed life support system
N80-10769

A method of defining the optimum level of ionizing radiation from determinate sources during space flights
N80-10770

Psychoprophylaxis of fatigue and functional cardiovascular diseases in pilots by means of self-conditioning
N80-10771

Use of short-arm centrifuge to prevent decon.ditioning when immersed in water [according to H-reflex]
N80-10772

Course of altitude caisson disease in dogs exposed to accelerations
N80-10773

Investigation of alveolaarterial difference for oxygen and carbon dioxide when breathing high-density gas mixtures
N80-10774

Toxic effects of chemicals in the altered gas environment of pressurized chambers
N80-10775

Effect of hypoxia on ATPase activity of the brain
N80-10776

USSR reports: Biomedical and behavioral science, no. 112
[JPRS-73882]
N80-10993

Lodging of grain crops and its detection by aerial photography
N80-10994

Health prognosis in flight discussed
N80-10995

The third system of regulation of animal and human functions, the active point system
N80-10996

Two important directions of development of Soviet biometry
N80-10997

Principles of ergonomic standards discussed
N80-10998

Minisubs for deep-sea exploration
N80-10999

Evaluation of heat flow components from heater to skin in an electric thermal suit
N80-11000

Ultrastructure of chlorella pyrenoidosa cells [strain g-11-1] following growth under conditions of a prolonged space flight
N80-11001

JTIDS PROGRAM OFFICE, HANSCOM AFB, MASS.
JTIDS system overview
N80-10180

K

KAMAN AEROSPACE CORP., BLOOMFIELD, CONN.
Design criteria for dry lubricated flight control bearings
[AD-A071322]
N80-10228

KENTUCKY UNIV., LEXINGTON.
Mass transfer and liquid-liquid dispersion in agitated vessels
N80-10449

KENTUCKY WATER RESOURCES RESEARCH INST., LEXINGTON.
Charged membrane, low pressure ultrafiltration to treat acid mine drainage waters
[PB-297289/9]
N80-10703

L

LABORATOIRE SUISSE DE RECHERCHES HORLOGERES, NEUCHATEL (SWITZERLAND).
Wear of modified electrical brush material in vacuum
[RAE-TRANS-2007]
N80-10435

LABORATORIUM FUER BETRIEBSFESTIGKEIT, DARMSTADT (WEST GERMANY).
Constant and variable loading fatigue strength of black-heart malleable cast iron regarding metallurgical characteristics
[ICAF-1089]
N80-10511

LEHIGH UNIV., BETHLEHEM, PA.
Fracture mechanics and surface chemistry studies of fatigue crack growth in an aluminum alloy
[AD-A071438]
N80-10519

LIFE SYSTEMS, INC., CLEVELAND, OHIO.
Extended duration orbiter study: CO2 removal and water recovery
[NASA-CR-160317]
N80-10800

Preprototype vapor compression distillation subsystem
[NASA-CR-160332]
N80-10801

LINCOLN LAB., MASS. INST. OF TECH., LEXINGTON.
Performance enhancement of the GPS receiver by data-free operation
N80-10172

Quasi-three-dimensional display of infrared radar images using range/intensity color mapping
[AD-A070671]
N80-10417

Flywheel energy storage and conversion system for solar photovoltaic applications
[COO-4094-31]
N80-10639

LOCKHEED-CALIFORNIA CO., BURBANK.
Reaction control system augmentation for V/STOL aircraft
N80-10130

LOCKHEED-GEORGIA CO., MARIETTA.
Reliability of nondestructive inspections
[AD-A072097]
N80-10503

LOGICON, INC., SAN DIEGO, CALIF.
Design considerations for the man-machine relations user interface to TAS
[AD-A071207]
N80-10802

LOS ALAMOS SCIENTIFIC LAB., N. MEX.
Photoionization mass spectrometric studies of selected compounds in a molecular beam
[LA-7727-T]
N80-10335

Storage stability of Kraton-bonded HMX-based explosives
[LA-UR-78-2728]
N80-10381

The 50kA flux pump for the superconducting transmission line test bed
[LA-6953-MS]
N80-10443

Heat pipe thermal control of slender optics probes
[LA-UR-78-3169]
N80-10467

VNAP: A computer program for computation of two-dimensional, time-dependent compressible, viscous, internal flow
[LA-7326]
N80-10470

Performance limits for liquid-metal heat pipes containing long adiabatic sections
[LA-UR-79-1241]
N80-10472

Mid-infrared optically pumped lasers
[LA-7331-MS]
N80-10491

Diffraction measurements for LASL's Antares laser system
[LA-7443-MS]
N80-10492

Selected results from the technology assessment of solar energy program
[LA-UR-79-950]
N80-10637

Economic performance of passive solar heating: A preliminary analysis
[LA-UR-78-2861]
N80-10645

Simple procedure for assessing thermal comfort in passive solar heated buildings
[LA-UR-79-1337]
N80-10649

Magnetopause layer and plasma boundary layer of the magnetosphere
[LA-UR-78-2992]
N80-10715

The 1978 symposium on the Rio Grande Rift. Program and abstracts
[LA-7487-C]
N80-10716

Introduction to VECTRAN and its use in scientific applications programming
[LA-7491-C]
N80-10830

Method of lines approach to the numerical solution of conservation laws
[LA-UR-79-837]
N80-10841

Bivariate distributions with given marginals and fixed measures of dependence
[LA-7700-MS]
N80-10851

Mechanisms of proton stability and decay in unified models
[LA-UR-79-3661]
N80-10875

General-purpose heat source project, space nuclear safety program, and radioisotopic terrestrial safety program
[LA-7568-PR]
N80-10886

Proposal for the theoretical investigation of light-ion beam propagation through a residual plasma environment
[LA-7990-P]
N80-10911

Fiber optic utilization at the Nevada Test Site
[LA-7829-MS]
N80-10912

Analytic coherent states for generalized potentials
[LA-UR-79-218]
N80-10951

Ion acceleration at the earth's bow shock: A review of observations in the upstream region
[LA-UR-79-309]
N80-10984

LOUISIANA STATE UNIV. AND A&M COLL., BATON ROUGE.
Electron excitation cross sections for multiply charged ions
[ORO-4881-23]
N80-10868

LOWELL UNIV., MASS.
Magneto-optical studies of paramagnetic systems to determine their potential for use as continuously tunable coherent far-infrared sources
N80-10899

M

MAGNAVOX GOVERNMENT AND INDUSTRIAL ELECTRONICS CO., TORRANCE, CALIF.
Transit: The current satellite navigation system
N80-10136

GPS receiver operation
N80-10170

MARYLAND UNIV., COLLEGE PARK.
A system for control structure implementation for image understanding
[AD-A071603]
N80-10805

On the numerical solution of Helmholtz equation by the finite element method
[DOE/ER-03443-79]
N80-10840

Time-dependent Hartree-Fock phase: Unique implication of variational principle
[ORO-5126-90]
N80-10842

MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
Flow on magnetizable particles in turbulent air streams
[NASA-CR-162418]
N80-10461

Source and propagation effects of Rayleigh waves from central Asian earthquakes
[AD-A070241]
N80-10714

Analysis techniques for use with the extended SDM model
[AD-A071647]
N80-10808

Issues in the digital implementation of control compensators
[NASA-CR-162416]
N80-10814

VAL: A value-oriented algorithmic language (preliminary reference manual)
[AD-A072994]
N80-10826

Electronic characteristics of 3 - 5 compounds
[AD-A071447]
N80-10939

Sensitivity analysis of optimal linear random parameter systems
[AD-A071091]
N80-10963

High energy electron radiation of wastewater liquid residuals
[PB-297393/6]
N80-10976

MATHEMATICAL SCIENCES NORTHWEST, INC., BELLEVUE, WASH.
Thermal and lighting efficiency standards
[PB-297429/3]
N80-10408

MCDONNELL-DOUGLAS ASTRONAUTICS CO., ST. LOUIS, MO.
Feasibility of commercial space manufacturing, production of pharmaceuticals. Volume 1: Executive summary
[NASA-CR-161324]
N80-10266

Feasibility of commercial space manufacturing, production of pharmaceuticals. Volume 2: Technical analysis
[NASA-CR-161325]
N80-10267

Feasibility of commercial space manufacturing, production of pharmaceuticals. Volume 3: Product data
[NASA-CR-161326]
N80-10268

MCDONNELL-DOUGLAS CORP., ST. LOUIS, MO.
Passive propellant system
[NASA-CASE-MFS-23642-1]
N80-10278

MCELROY [RALPH] CO., AUSTIN, TEX.
Electrochemical copper coatings for surface finishing of hf resonators
[LA-TR-79-10]
N80-10352

MCGILL UNIV., MONTREAL [QUEBEC].
ASTP at Barbados: Mesoscale pools of Amazon River water in the western tropical Atlantic
N80-10348

MEDICAL COLL. OF WISCONSIN, MILWAUKEE.
Effect of a rapid 4 percent carboxyhemoglobin saturation increase on maximal treadmill exercise [PB-296627/3] N80-10706
MICHIGAN UNIV., ANN ARBOR.
Math modeling and computer mechanization for real time simulation of rotary-wing aircraft [NASA-CR-162400] N80-10137
Theory of dielectric-filled edge-slot antennas [AD-A071943] N80-10418
MIDWEST RESEARCH INST., GOLDEN, COLO.
Solar pond concepts: Old and new [SERI/TP-35-280] N80-10663
MISSOURI UNIV. -ROLLA.
The biological conversion of corn residue into ethyl alcohol using an immobilized-cell reactor N80-10376
MISSOURI UNIV. AT ROLLA.
Analysis and synthesis of space imagery of the southeastern-Turkey/northwestern-Iran mobile belt N80-10544
Phototectonic analysis of southeastern Spain from ASTP photographs and LANDSAT images N80-10548
Photogeologic analysis of ASTP photographs of the Lake Torrens-Flinders Ranges-Lake Blanche area, South Australia N80-10550
MITRE CORP., MCLEAN, VA.
Near term potential of wood as a fuel [MCP/C4101] N80-10389
Biomass-based alcohol fuels: The near-term potential for use with gasoline [MCP/T4101-03] N80-10393
Design of a pilot silvicultural biomass farm at the Savannah River Plant [MCP/T4101-01] N80-10394
Environmental data for energy technology policy analysis. Volume I: Summary [MCP/EV6119-1] N80-10629
Health and environmental effects of coal gasification and liquefaction technologies: A workshop summary and panel reports [PB-297610/1] N80-10701
MODEL RESEARCH AND DEVELOPMENT CORP., PRINCETON, N. J.
Research guidance studies to assess gasoline from coal by methanol-to-gasoline and tassel-type Fischer-Tropsch technologies [FE-2447-13] N80-10388
MONSANTO RESEARCH CORP., DAYTON, OHIO.
Analysis of priority pollutants at a primary aluminum production facility [PB-297491/3] N80-10707

N

NATIONAL ACADEMY OF SCIENCES - NATIONAL RESEARCH COUNCIL, WASHINGTON, D. C.
Geothermal resources and technology in the United States [PB-296623/2] N80-10677
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D. C.
The significance of wing end configuration in airfoil design for civil aviation aircraft [NASA-TM-75711] N80-10104
Short description of mathematical support programs for space experiments in the Interkosmos program [NASA-TM-75629] N80-10265
Study of periodic motions of a satellite with a magnetic damper [NASA-TM-75667] N80-10273
The scatter of mechanical values of carbon fiber composites and its causes [NASA-TM-75698] N80-10317
Two-dimensional nonstationary model of the propagation of an electron beam in a vacuum [NASA-TM-75693] N80-10435
Fundamentals of heat measurement [NASA-TM-75690] N80-10459
Semiconductor millimeter and centimeter wave radiometer for the study of the radiation of an underlying surface [NASA-TM-75671] N80-10477
Experimental study of the vidicon system for information recording using the wide-gap spark chamber of gamma - telescope gamma-1 [NASA-TM-75644] N80-10478
Algorithm for constructing the programmed motion of a bounding vehicle for the flight phase [NASA-TM-75668] N80-10497
Analysis of method of polarization surveying of water surface oil pollution [NASA-TM-75708] N80-10686
The effect of dynamic factors of space flight on animal organisms [NASA-TM-75692] N80-10745
Aerospace medicine and biology: A continuing bibliography with indexes [NASA-SP-7011(190)] N80-10778
BEYSIK: Language description and handbook for programmers [system for the collective use of the Institute of Space Research, Academy of Sciences USSR] [NASA-TM-75680] N80-10813
Elements of the theory of molecular spectra [NASA-TM-75686] N80-10866
Temperature deformations of the mirror of a radio telescope antenna [NASA-TM-75633] N80-10908
Establishment of the spectra of kinetic turbulence [NASA-TM-75666] N80-10914
Numerical experiments on the theta pinch [NASA-TM-75696] N80-10915
NASA Tech Briefs Index, 1978 [NASA-SP-7021(20)] N80-10967
NASA Tech Briefs Index, 1977, volume 2, numbers 1-4 [NASA-SP-7021(19)] N80-10968
Cumulative index to NASA Tech Briefs, 1970-1975 [NASA-SP-7021(18)] N80-10969
Non-equilibrium processes in interstellar molecules [NASA-TM-75685] N80-10981
Propagation of waves in a medium with high radiation pressure [NASA-TM-75679] N80-10982
Hydrodynamics of primordial black hole formation [NASA-TM-75918] N80-10983
Results and interpretation of measurements of the light flux in the near-surface layer of the Venusian atmosphere [NASA-TM-75716] N80-10988
On the structure of the upper atmosphere of Mars according to data from experiments on the Viking space vehicles [NASA-TM-75717] N80-10989
Numerical modeling of stimulation of induced magnetosphere during interaction of solar wind with the ionosphere of Venus [NASA-TM-75921] N80-10990
Algorithms for locating celestial sources of X-rays and gamma flares with the aid of several spacecraft [NASA-TM-75920] N80-10991
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. AMES RESEARCH CENTER, MOFFETT FIELD, CALIF.
Workshop on Thrust Augmenting Ejectors [NASA-CP-2093] N80-10107
NASA overview N80-10109
Pioneer Saturn encounter [NASA-TM-80007] N80-10239
Coupled rotor and fuselage equations of motion [NASA-TM-81153] N80-10516
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. HUGH L. DRYDEN FLIGHT RESEARCH CENTER, EDWARDS, CALIF.
Shuttle orbiter radar cross-sectional analysis [NASA-TM-72870] N80-10276
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. GODDARD SPACE FLIGHT CENTER, GREENBELT, MD.
Educator's guide for Mission to Earth: LANDSAT views the world [NASA-SP-360] N80-10337
NSSDC data listing [NASA-TM-80349] N80-10956
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEX.
Navigation and meteorological error equations for some aerodynamic parameters [NASA-TM-80004] N80-10150
Compound oxidized styrylphosphine [NASA-CASE-MSC-14903-2] N80-10358
Self-calibrating threshold detector [NASA-CASE-MSC-16370-1] N80-10413
Apollo-Soyuz test project. Volume 2: Earth observations and photography [NASA-SP-412-VOL-2] N80-10538
Summary of significant results N80-10539
Visual observations over oceans N80-10563
Film selection for the earth observations and photography experiment N80-10578
Portable breathing system [NASA-CASE-MSC-16182-1] N80-10799
Lyapunov stability and its application to systems of ordinary differential equations [NASA-TM-80006] N80-10835
Refraction corrections for surveying [NASA-TM-80003] N80-10907
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, HAMPTON, VA.
Effect of winglets on a first-generation jet transport wing. 6: Stability characteristics for a full-span model at subsonic speeds [NASA-TP-1339] N80-10101
Wind-tunnel investigation of the validity of a sonic-boom-minimization concept [NASA-TP-1421] N80-10102
Estimation of attainable leading-edge thrust for wings at subsonic and supersonic speeds [NASA-TP-1500] N80-10105
Effect of several airframe/nozzle modifications on the drag of a variable-sweep bomber configuration [NASA-TM-80129] N80-10106
Low-speed wind-tunnel tests of a 1/10-scale model of an advanced arrow-wing supersonic cruise configuration designed for cruise at Mach 2.2 [NASA-TM-80152] N80-10135
A flight investigation of performance and loads for a helicopter with NLR-1T main-rotor blade sections [NASA-TM-80165] N80-10136
Technical evaluation report on the fluid dynamics panel Symposium on High Angle of attack aerodynamics [AGARD-AR-145] N80-10147
Algorithms and logic for incorporating ILS NASA TCV B-737 airplane area navigation system [NASA-TM-80167] N80-10152
Experiments in sensing transient rotational acceleration cues on a flight simulator [NASA-TP-1537] N80-10193
AGARD two-dimensional aeroelastic configurations [AGARD-AR-156] N80-10202
Comparison of stability and control parameters for a light, single-engine, high-winged aircraft using different flight test and parameter estimation techniques [NASA-TM-80163] N80-10225
Digital PSK to BIO-L demodulator for 2 sup ea[bit rate] carrier [NASA-TM-80159] N80-10433
An experimental investigation to determine the effect of window cooling by mass injection for the Shuttle Infrared Leeside Temperature Sensing (SILTS) experiment [NASA-TM-80170] N80-10458
Light airplane crash tests at three roll angles [NASA-TP-1477] N80-10512
The 1977 emissions inventory for southeastern Virginia [NASA-TM-80119] N80-10685
Application of queueing models to multiprogrammed computer systems operating in a time-critical environment [NASA-TM-80143] N80-10854
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LEWIS RESEARCH CENTER, CLEVELAND, OHIO.
Coannular supersonic ejector nozzles N80-10128
Aeropropulsion 1979 [NASA-CP-2092] N80-10205
Aircraft Energy Efficiency [ACEE] status report N80-10206
Emission reduction N80-10207
Noise reduction N80-10208
Alternative jet aircraft fuels N80-10209
Materials and structures technology N80-10210
Computational fluid mechanics of internal flow N80-10211
Turbomachinery technology N80-10212
Mechanical components N80-10213
Instrumentation technology N80-10214
Control technology N80-10215
Supersonic propulsion technology N80-10216
Hypersonic propulsion N80-10217
Vertical Takeoff and Landing [VTOL] propulsion technology N80-10218
High-performance-vehicle technology N80-10219
Analysis of the response of a thermal barrier coating to sodium and vanadium doped combustion gases [NASA-TM-79205] N80-10344
Some techniques for reducing the tower shadow of the DOE/NASA mod-0 wind turbine tower [NASA-TM-79202] N80-10594
NASA-Lewis closed-cycle magnetohydrodynamics plant analysis [NASA-TM-79249] N80-10595
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.
Spacelab payload accommodation handbook. Appendix B: Structure interface definition module [NASA-TM-80008] N80-10272
Passive propellant system [NASA-CASE-MFS-23642-1] N80-10278
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. PASADENA OFFICE, CALIF.
Molten salt pyrolysis of latex [NASA-CASE-NPO-14315-1] N80-10361
Start up system for hydrogen generator used with an internal combustion engine [NASA-CASE-NPO-13849-1] N80-10374
Continuous coal processing method and means [NASA-CASE-NPO-13758-2] N80-10377

Sodium storage and injection system
[NASA-CASE-NPO-14384-1] N80-10694

System for detecting substructure microfractures and method therefore
[NASA-CASE-NPO-14192-1] N80-10697

Borehole geological assessment
[NASA-CASE-NPO-14231-1] N80-10709

NATIONAL BUREAU OF STANDARDS, WASHINGTON, D. C.

Studies on the photodegradation of poly [methyl methacrylate]
[PB-297793/2] N80-10371

Models for the migration of paraffinic additives in polyethylene
[PB-297671/8] N80-10372

Dimensions/NBS. Volume 63, Number 3, March 1979
[PB-296733/9] N80-10405

The calibration of a roundness standard
[PB-297798/0] N80-10406

Standards system in Canada, the UK, West Germany, and Denmark: An overview
[PB-296912/9] N80-10407

A linearized finite difference computation of fluid heating in an enclosure
[PB-296053/0] N80-10474

A perspective of a workshop on stability of thin film solar cells and materials
[PB-297396/4] N80-10676

Self-study manual on optical radiation measurements Part 1: Concepts. Chapters 7: The relative spectral responsivity and slit-scattering function of a spectroradiometer. Chapter 8: Deconvolution. Chapter 9: Physically defining measurement-beam geometry by using opaque barriers.
[PB-296047/4] N80-10740

Dimensions/NBS, volume 63, no. 6, June 1979
[PB-297836/9] N80-10975

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Investigation of possible sun-weather relationships
[PB-297385/7] N80-10719

NATIONAL GEOPHYSICAL AND SOLAR-TERRESTRIAL DATA CENTER, BOULDER, COLO.

Magnetic potential plots over the northern hemisphere for 26-28 March 1976
[PB-297195/8] N80-10718

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, SEATTLE, WASH.

Observations of internal-wave surface signatures in ASTP photographs
N80-10570

Circulation and hydrography near Kodiak Island, September to November 1977
[PB-297421/8] N80-10743

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, WASHINGTON, D. C.

Interpreting ASTP photographs of the ocean and locating the area photographed, case study of the Gulf of Mexico
N80-10562

Mesoscale cloud patterns revealed by ASTP photographs
N80-10576

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Physical properties data compilations relevant to energy storage. 3: Engineering properties of single and polycrystalline sodium beta and beta-alumina
[PB-297847/6] N80-10946

NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA.

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[NTIS/PS-79/0680/3] N80-10324

Metal matrix composites. Volume 3: A bibliography with abstracts
[NTIS/PS-79/0681/1] N80-10325

Strip transmission lines, volume 2. Citations from the NTIS data base
[NTIS/PS-79/0618/3] N80-10445

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[NTIS/PS-79/0620/9] N80-10446

Strip transmission lines. Volume 2: Citations from the engineering index data base
N80-10447

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[NTIS/PS-79/0637/3] N80-10506

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[NTIS/PS-79/0803/1] N80-10530

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[NTIS/PS-79/0804/9] N80-10531

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[NTIS/PS-79/0676/1] N80-10666

Nickel cadmium batteries. Volume 1: Citations from the NTIS data base
[NTIS/PS-79/0646/4] N80-10669

Nickel cadmium batteries. Volume 2: A bibliography with abstracts
[NTIS/PS-79/0647/2] N80-10670

Lithium batteries. Volume 2: Citations from the NTIS data base
[NTIS/PS-79/0674/6] N80-10671

Lithium batteries. Volume 3: Citations from the NTIS data base
[NTIS/PS-79/0675/3] N80-10672

Microwave heating: Applications and equipment. Citations from NTIS data base
[NTIS/PS-79/0631/6] N80-10673

Microwave heating: Industrial applications. Citations from the engineering data base
[NTIS/PS-79/0632/4] N80-10674

Lead batteries, volume 1. Citations from the engineering index data base
[NTIS/PS-79/0781/9] N80-10680

Lead batteries, volume 2. Citations from the engineering index data base
[NTIS/PS-77/0634] N80-10681

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[NTIS/PS-79/0780/1] N80-10682

Liquid crystals, volume 1. A bibliography with abstracts
[NTIS/PS-79/0795/9] N80-10947

Liquid crystals, volume 2. A bibliography with abstracts
[NTIS/PS-79/0796/7] N80-10948

NAVAL AIR DEVELOPMENT CENTER, WARMINSTER, PA.

An overview of current Navy programs to develop thrust augmenting ejectors
N80-10110

The evolution of JTIDS
N80-10179

Navigation architecture
N80-10181

Integrated Tactical Navigation Systems (JTNS)
N80-10182

JTIDS signal structure
N80-10184

The development of Antiguard, a clear, water displacing, corrosion preventive compound
[AD-A071617] N80-10347

Thermal conduction effects in human skin. Phase 2: Experimental validation and application of data in selection of materials
[AD-A068488] N80-10783

NAVAL AIR SYSTEMS COMMAND, WASHINGTON, D. C.

The XFV-12A Thrust-Augmented Wing (TAW) prototype aircraft
N80-10133

NAVAL OCEAN SYSTEMS CENTER, SAN DIEGO, CALIF.

Integration developments
N80-10188

Remote operator performance comparing mono and stereo TV displays: The effects of visibility, learning and task factors
[AD-A068201] N80-10795

NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.

Entrainment characteristics of unsteady subsonic jets
N80-10124

Analysis of statistical parameters from satellite digital data, July 1978 GOES-west, for use in diagnosing marine fog
[AD-A072145] N80-10735

NPS-PASCAL: A pascal implementation for microprocessor-based computer systems
[AD-A071972] N80-10806

Convergence zone prediction models with programs for use on HP-67 and HP-97 programmable calculators
[AD-A072050] N80-10809

A tactical system emulator for a distributed microcomputer architecture
[AD-A072578] N80-10810

NAVAL RESEARCH LAB., WASHINGTON, D. C.

The timation navigation satellites
N80-10157

Clocks: Evolution of frequency standards
N80-10161

DARPA-NRL laser program
[AD-A072399] N80-10489

Material response to 500 keV proton beams at intensities below 1 GW/cm2
[AD-A072416] N80-10520

Acoustic Fluctuation Workshop: Technical review, editorial summary, synopsis and papers, volume I
[AD-A072309] N80-10862

NAVAL SURFACE WEAPONS CENTER, WHITE OAK, MD.

Observations on parachute scale factors for modeling parachute deployment and steady state performance
[AD-A070571] N80-10138

New binder system for composite solid propellants
N80-10298

OAK RIDGE NATIONAL LAB., TENN.

NAVAL UNDERWATER SYSTEMS CENTER, NEW LONDON, CONN.

Optimization of computer operating systems
[AD-A071463] N80-10834

NAVAL WEAPONS CENTER, CHINA LAKE, CALIF.

The role of particulate damping in the control of combustion instability by aluminum combustion
N80-10296

Application of combustion instability research to solid propellant rocket motor problems
N80-10303

NEW MEXICO UNIV., ALBUQUERQUE.

Boundary layer control. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0812/2] N80-10145

Boundary layer separation. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0813/0] N80-10146

Hydrogen as a fuel. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0771/0] N80-10397

Hydrogen production. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0773/6] N80-10401

Hydrogen storage as a hydride. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0772/8] N80-10402

Remote sensing applied to agricultural resources. Citations from the international aerospace abstracts data base
[NTIS/PS-79/0733/0] N80-10388

Waste utilization as an energy source. Citations from the International Aerospace Abstracts Data Base
[NTIS/PS-79/0765/2] N80-10667

Aircraft fuel. Citations from the International Aerospace Abstracts Data Base
[NTIS/PS-79/0764/5] N80-10668

NEW YORK UNIV., N. Y.

Acceleration of transonic potentials flow calculations on arbitrary meshes by the multiple grid method
[AD-A072301] N80-10142

NORTH CAROLINA STATE UNIV. AT RALEIGH.

Structural stiffening as an interior noise control technique for light twin-engine aircraft
N80-10192

A two-dimensional model of the interaction of a transverse jet in a supersonic stream with application to supersonic combustion
N80-10328

An investigation of the effects of internal solidification on turbulent-flow heat transfer and pressure drop in a horizontal tube
N80-10436

Development of mathematical models to describe the wear process in viscoelastic materials
N80-10496

NORTH CAROLINA UNIV. AT CHAPEL HILL.

On estimating variance of subset estimators when the errors are asymmetric
[AD-A072598] N80-10839

NORTH DAKOTA STATE UNIV., FARGO.

Use of predistortion to reduce intermodulation distortion in optical fiber communication sources
[AD-A072637] N80-10910

NORTHEASTERN UNIV., BOSTON, MASS.

Variable sample time algorithms for microcomputer control of distributed parameter systems
N80-10450

Magnetic field studies of electronic Raman scattering in rare-earth nitrides
N80-10930

NORTHWESTERN UNIV., EVANSTON, ILL.

Factors affecting the retirement of commercial transport jet aircraft
[NASA-CR-152308] N80-10148

Computer simulation of kinetic properties of plasma
[COO-2280-10] N80-10920

NOTRE DAME UNIV., IND.

Optimal control studies of a solar heating system
[LA-UR-78-2556] N80-10646

NUCLEAR SERVICES CORP., CAMPBELL, CALIF.

Risk analysis methodology and data: Study of alternatives for long-term management of Hanford defense high-level radioactive waste
[NSC-PS-ARH-77001] N80-10891

O

OAK RIDGE NATIONAL LAB., TENN.

Ductility in bending of molybdenum alloys irradiated between 425 and 1000C
[CONF-790125-53] N80-10354

Tensile properties of type 316 stainless steel irradiated in a simulated fusion reactor environment
[CONF-790125-50] N80-10355

Creep behavior of Hastelloy X, 21/4 Cr-1 Mo steel, and other alloys in simulated HTGR helium
[ORNL/TM-6822] N80-10357

Improvements in remote equipment torquing and fastening
[CONF-781105-64] N80-10499

Steam turbines
[ANL/CES/TE-78-7] N80-10502

Stress analysis of cylindrical pressure vessels with closely spaced nozzles by the finite-element method. Volume 3: Vessels with three nozzles under internal pressure and external loadings
[NUREG-CR-0907-VOL-3] N80-10527
Computer software to calculate and map geologic parameters required in estimating coal production costs
[EPRI-EA-674] N80-10584
Computer mapping software and geographic data base development: Oak Ridge National Laboratory user experience
[CONF-780727-1] N80-10586
Survey of solar thermal energy storage subsystems for thermoelectric applications
[ORNL/TM-5758] N80-10627
State-of-the-art survey of joinability of materials for OTEC heat exchangers
[ORNL/TM-6284] N80-10647
Socioeconomic data requirements for environmental assessment: Coal gasification and liquefaction projects
[CONF-780843-5] N80-10693
Environmental implications for geothermal energy development
[CONF-790645-3] N80-10694
Meteorological data bases available for the United States Department of Energy Oak Ridge Reservation
[ORNL/TM-6358] N80-10739
Types of aquatic microcosms and their research applications
[CONF-781101-1] N80-10747
National library of medicine toxicology data base management system
[ORNL/CSD/TM-50] N80-10785
Theory of electron transfer and ionization
[CONF-790430-1] N80-10876
Development of cements for high level radioactive waste fixation
[CONF-790430-10] N80-10890
Study of a tokamak cleaning method utilizing glow discharge
[ORNL-TR-6864] N80-10921
Structure solution methods for superstructures
[CONF-790542-1] N80-10945
Time series analysis by the maximum entropy method
[ORNL-5332] N80-10950
Thermodynamics of precipitation systems
[ORNL-5537] N80-10955
On the design of an interactive information retrieval program
[CONF-780990-1] N80-10960

OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES, PARIS (FRANCE).
Research in the field of solid propellant rockets: A survey
N80-10282
Ignition and extinction of solid propellants
N80-10284
Recent ONERA studies on combustion instabilities in solid propellant rocket motors
N80-10302

OHIO STATE UNIV., COLUMBUS.
An experimental investigation of forced mixing of a turbulent boundary layer in an annular diffuser
N80-10896
Swept frequency scattering measurements of aircraft
[AD-A071474] N80-10420
The spherical wave phase difference temporal power spectra for light beams degraded by a turbulent atmosphere
N80-10898

OHIO STATE UNIV. RESEARCH FOUNDATION, COLUMBUS.
Scattering of acoustic waves by elastic and viscoelastic obstacles of arbitrary shape immersed in a fluid
[AD-A072274] N80-10861

OHIO UNIV., ATHENS.
Study of structure of light nuclei with neutrons
[COO-2490-9] N80-10872

OKLAHOMA UNIV., NORMAN.
Analyses of plates constructed of fibre-reinforced bimodulus composite materials
[AD-A071377] N80-10520
Finite-element analysis of laminated composite-material plates
[AD-A071390] N80-10521
Recent research in composite and sandwich plate dynamics
[AD-A072277] N80-10522
A memory retrieval aid for hypothesis generation
[AD-A072657] N80-10795

OLD DOMINION UNIV. RESEARCH FOUNDATION, NORFOLK, VA.
Evaluation of atmospheric trace constituent sensors operating from remote space and airborne platforms
[NASA-CR-162365] N80-10711

P

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
Fuels by algae hydrogenation
N80-10375
Transient aspect of hydroplaning: Hydroplaning phenomenon during sudden changes in the fluid layer on a pavement
N80-10448
Evaluation of a locally homogeneous flow model of spray evaporation
N80-10453
Coincidence of higher-order modes: A mechanism of the excitation of cylindrical shell vibrations via internal sound
N80-10510
Likelihood estimations of vegetative alteration near known or proposed sources of air pollution
[COO-4497-1] N80-10690
Plasma volume changes in fit men and women during a humid heat stress before and after an acclimation
N80-10781
Kidney cell electrophoresis
[NASA-CR-160353] N80-10782
Atom-surface interactions derived from scattering data
N80-10925
The application of an additive-ultimate model to the evaluation of transportation system management strategies
N80-10966

PENNSYLVANIA UNIV., PHILADELPHIA.
Optimal insulation of pipes and tanks for solar heating systems
[ALO-5319-2] N80-10680

PITTSBURGH UNIV., PA.
Flammability and thermal stability of polyphosphazenes copolymers, part 1
[AD-A072114] N80-10366
Development and testing of a three-stage double tandem accelerator-decelerator system for low energy, highly stripped ions
[COO-4257-3] N80-10878

PLANETARY SCIENCE INST., PASADENA, CALIF.
Lunar radar backscatter studies
[NASA-CR-162415] N80-10986

POLITECNICO DI MILANO (ITALY).
Ignition and extinction of solid rocket propellants
N80-10285
Self-sustained oscillatory combustion of solid rocket propellants
N80-10304
Gas phase velocity measurements in solid rocket propellants by Laser Doppler anemometry
N80-10311

POLYTECHNIC INST. OF NEW YORK.
Second-order perturbation theory for Fabry-Perot resonators
N80-10904

PRATT AND WHITNEY AIRCRAFT, EAST HARTFORD, CONN.
VSCE technology definition study
[NASA-CR-159730] N80-10222

PRATT AND WHITNEY AIRCRAFT GROUP, EAST HARTFORD, CONN.
Aero-acoustic tests of duct-burning turbofan exhaust nozzles
[NASA-CR-162254] N80-10204
Flight effects on the aero/acoustic characteristics of inverted profile coannular nozzles
[NASA-CR-163419] N80-10220
Experimental evaluation of a low emissions high performance duct burner for Variable Cycle Engines (VCE)
[NASA-CR-159694] N80-10221
Effect of time dependent flight loads on JT9D-7 performance deterioration
[NASA-CR-159681] N80-10515

PRC ENERGY ANALYSIS CO., LOS ANGELES, CALIF.
Satellite Power System (SPS) preliminary societal assessment
[HCP/R4024-01/14] N80-10657

PRINCETON UNIV., N. J.
Aluminum combustion under rocket motor conditions
N80-10294
Investigation of the T sub II (T sub g) relaxation of homopolymers and block copolymers of styrene by torsional braid analysis
[AD-A072875] N80-10363
Biomass energy enhancement: A report to the President's Council on Environmental Quality
[PB-296634/0] N80-10396
Transient eddy currents on finite plane and toroidal conducting surfaces
[PPPL-1517] N80-10444

PROPELLANTS, EXPLOSIVES AND ROCKET MOTOR ESTABLISHMENT, WALTHAM ABBEY (ENGLAND).
Composites in future motor hardware: A research view
N80-10309

PROPELLANTS, EXPLOSIVES AND ROCKET MOTOR ESTABLISHMENT, WESTCOTT (ENGLAND).
Some measurements of ignition delay and heat transfer with pyrogen igniters
N80-10290
Boundary layer models of erosive burning
N80-10291
Ultrasonic imaging as applied to non-destructive testing of rocket propellants
N80-10313
Measurement of thrust transients in rocket motors
N80-10316

PUBLIC SERVICE ELECTRIC AND GAS CO., NEWARK, N. J.
Battery Energy Storage Test (BEST) facility
[EPRI-EM-1005] N80-10628

PURDUE UNIV., LAFAYETTE, IND.
Some steady state exact solutions of the wind-driven circulation equations for a rigid-lid shallow lake
[PB-297206/5] N80-10589

Q

QUEEN MARY COLL., LONDON (ENGLAND).
Fracture mechanics of inelastic polymers
[AD-A072615] N80-10368

R

RADIO CORP. OF AMERICA, PALO ALTO, CALIF.
Method of time series modelling, parameter and state estimation of nonlinear systems
N80-10853

RAND CORP., SANTA MONICA, CALIF.
Soviet energy balances
[RAND/R-2257-DOE] N80-10634
Resolving environmental issues in energy development: Rules for the Department of Energy and its field offices
[RAND/R-2335-DOE] N80-10636

RCA LABS., PRINCETON, N. J.
Analysis of S-band solid-state transmitters for the solar power satellite
[NASA-CR-160320] N80-10600

RENSSELAER POLYTECHNIC INST., TROY, N. Y.
The effect of environmental variables on the stress corrosion cracking behavior of type 304 stainless steel in high temperature water environments
N80-10342
Theory of realizability for linearly elastic trusses-structures and related applications in optimum structural design
N80-10509
Physical properties data compilations relevant to energy storage, 2. Molten salts: Data on single and multi-component salt systems
[NSRDS-NBS-61-PT-2] N80-10643
Polycrystalline thin film gallium arsenide solar cells
[PB-298168/6] N80-10675
An experimental investigation of angular effects on the Mossbauer linebreadth and time domain analysis of Mossbauer line broadening
N80-10926

RESEARCH TRIANGLE INST., RESEARCH TRIANGLE PARK, N. C.
Analysis of organic air pollutants by gas chromatography and mass spectroscopy
[PB-296835/2] N80-10699

RICE UNIV., HOUSTON, TEX.
Study to analyze and synthesize satellite data
[AD-A070947] N80-10712

ROCHESTER UNIV., N. Y.
Creep and recovery of amorphous polymers
N80-10359
Scalar diffraction analysis of light scattering by epithelial cells from a line focused laser beam
N80-10484
Multiple photon process in SF6
N80-10485
Strip trees: A hierarchical representation for map features
[AD-A071124] N80-10582
Use of the pupil to study the scotopic and chromatic mechanisms of vision in humans
N80-10777
Progressive refinement of raster images
[AD-A072517] N80-10823
Theory of phonon echoes in insulators
N80-10858
Proton deuteron elastic scattering from 20 to 220 GeV/c
N80-10863
Design, engineering, and manufacturing aspects of gradient index optical components
N80-10900
Frustrated total reflection polarizer for the infrared
N80-10901
A study of soft X-ray laser schemes in multi-component laser plasmas
N80-10913
Study of internal friction in single crystal silicon
N80-10928

ROCKWELL INTERNATIONAL CORP., COLUMBUS, OHIO.
Vinci/inviscid interaction analysis of thrust augmenting ejectors
N80-10112
Computer aided design study of hypermixing nozzles
N80-10116
An investigation of corner separation within a thrust augmenter having Coanda jets
[NADC-76153-30] N80-10122
Design and test of a prototype scale ejector wing
N80-10131
Visual search performance in simulated remotely piloted vehicle utilization as a function of auxiliary task loading on the observer
[AD-A072402] N80-10804
ROCKWELL INTERNATIONAL CORP., CREVE COUER, MO.
Regional air pollution study. Dichotomous aerosol sampling system
[PB-297310/5] N80-10338
Regional air pollution, quality assurance audits
[PB-297576/1] N80-10702
ROCKWELL INTERNATIONAL CORP., DOWNEY, CALIF.
Principle of operation of NAVSTAR and system characteristics
N80-10138
Launch Vehicles
N80-10176
ROCKWELL INTERNATIONAL SCIENCE CENTER, THOUSAND OAKS, CALIF.
A computational model for three-dimensional incompressible wall jets with large cross flow
N80-10115
ROYAL AIRCRAFT ESTABLISHMENT, FARNBOROUGH [ENGLAND].
Development of an air heater for a mixture formation test rig
[RAE-TRANS-2912] N80-10232
Wear of modified electrical brush material in vacuum
[RAE-TRANS-2907] N80-10436
A new method of electric measurement of crack length
[RAE-TRANS-2916] N80-10517

S

SAINT LOUIS UNIV., MO.
An ac large signal model for the GaAs MESFET
[AD-A071663] N80-10936
SALFORD UNIV. [ENGLAND].
Multivariable digital control systems
[AD-A071662] N80-10226
SANDIA LABS., ALBUQUERQUE, N. MEX.
Accelerated aging of parachute materials
[SAND-79-0894C] N80-10144
Electronic reduction of high speed mass spectral data
[SAND-79-0709] N80-10336
Stresses in sputter deposited Nickel and Copper oxide thin films
[SAND-79-0045C] N80-10351
Morphology of rubber modified epoxy encapsulants
[SAND-79-0158C] N80-10370
Heat transfer into the infinite region external to a cylinder
[SAND-78-1942] N80-10466
Coded aperture imaging: A comparison between Fresnel zone apertures and uniformly redundant array apertures
[SAND-78-1625] N80-10481
Dependence of fracture toughness of molybdenum laser welds on deatrinic spacing and in situ titanium additions
[SAND-79-0193C] N80-10501
Viscoplastic finite element analysis of steady-state forming processes including strain history and stress flux dependence
[SAND-77-1663C] N80-10528
Dispersed power systems and total energy
[SAND-78-2006C] N80-10608
Safety and environmental implications DOE/Sandia Midtemperature Solar Systems Test Facility
[SAND-78-2292C] N80-10609
Sensitivity study of Brayton cycle power plant performance
[SAND-78-8820] N80-10626
Analytical evaluation of a solar thermophotovoltaic [TPV] converter
[SAND-79-0504C] N80-10638
Graphical representation of TMY solar radiation availability for one- and two-axis solar collectors
[SAND-79-0418] N80-10640
Studies of the abnormally high peak voltage observed with FeS2 depolarized thermal batteries
[SAND-79-0096] N80-10641
Numerical simulation of dual-media thermal energy storage systems
[SAND-78-2282C] N80-10642
Determination of the technical and economic feasibility of luminescent solar concentrators
[SAND-79-7085] N80-10650
Summary of project to develop handbook of human reliability analysis for nuclear power plant operations
[SAND-78-1812C] N80-10797
Risk methodology for geologic disposal of radioactive waste: The Sandia Waste Isolation Flow and Transport (SWIFT) model
[SAND-78-1267] N80-10864
Safeguards methodology development history
[SAND-79-0059C] N80-10892
Modified method of perturbed stationary states 1
[SAND-78-0235] N80-10895
Summary of the Sandia Materials Information data bank
[SAND-78-1961C] N80-10959
Sandia Irradiator for Dried Sewage Solids
[SAND-79-0182] N80-10971
SANDIA LABS., LIVERMORE, CALIF.
Applications analysis of fixed site hydrogen storage
[SAND-78-8272] N80-10384
Production of hydrogen, deuterium, and helium by 15-MeV neutrons
[COO-2719-5] N80-10873
Alpha transport and blistering in tokamaks
[SAND-78-8684] N80-10916
SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CALIF.
Antipodal seas
N80-10364
SINGER-KEARFOTT, WAYNE, N. J.
An/URQ-28 JTIDS class 2 tactical terminal
N80-10186
SMITHSONIAN INSTITUTION, WASHINGTON, D. C.
Color zoning in the western desert of Egypt
N80-10353
Orbital observations of sand distribution in the western desert of Egypt
N80-10354
Preliminary analysis of color variations of sand deposits in the western desert of Egypt
N80-10355
Temporal changes as depicted on orbital photographs of arid regions in North Africa
N80-10356
ASTP photographs of southeastern Angola
N80-10357
Color of desert surfaces in the Arabian peninsula
N80-10358
Monte Desert of San Juan, Argentina, as photographed by ASTP
N80-10359
Determining photograph locations over oceans
N80-10361
Maltese Front and Strait of Sicily ocean pattern analysis
N80-10365
Analysis of water color as seen in orbital and aerial photographs of Cape Cod, Nantucket, and Martha's Vineyard, Massachusetts
N80-10367
Suspended-sediment dispersal patterns of river deltas photographed by ASTP
N80-10372
Comparison of astronaut visual color observations with ASTP photographs
N80-10377
SOCIETE EUROPEENNE DE PROPULSION, BORDEAUX [FRANCE].
Predicting the behavior of phenolic ablative materials
N80-10310
SOUTHAMPTON UNIV. [ENGLAND].
Cryogenic wind tunnel activities at the University of Southampton
[NASA-CR-159144] N80-10231
SOUTHWEST RESEARCH INST., SAN ANTONIO, TEX.
Mechanism of turbine engine lubricant deposition
[AD-A072357] N80-10223
SRI INTERNATIONAL CORP., MENLO PARK, CALIF.
Novel duplex vapor: Electrochemical method for silicon solar cells
[NASA-CR-162387] N80-10297
STANFORD LINEAR ACCELERATOR CENTER, CALIF.
Heavy lepton phenomenology
[SLAC-PUB-2219] N80-10883
STANFORD TELECOMMUNICATIONS, INC., SUNNYVALE, CALIF.
Global positioning system: Signal structure and performance characteristics
N80-10159
A time transfer unit for GPS
N80-10167
STANFORD UNIV., CALIF.
The development of aluminum-aluminum oxide alloys by mechanical alloying
N80-10340
Research on adaptive antenna techniques 2
[AD-A071338] N80-10419
Computer calculations of traveling-wave periodic structure properties
[SLAC-PUB-2295] N80-10423
Mixing conditions and limit theorems for maxima of some stationary sequences
[COO-2874-38] N80-10844
Matrix inverse eigenvalue problem for periodic Jacobi Matrices
[STAM-CS-78-684] N80-10855
Experimental review of beam polarization in high energy positron electron storage rings
[SLAC-PUB-2298] N80-10896
STATE UNIV. OF NEW YORK AT BUFFALO.
Analytical solutions for heat conduction in anisotropic media homogeneous in cylindrical coordinates at rest and in motion
N80-10452
STATE UNIV. OF NEW YORK AT STONY BROOK.
Continuous simulation of queueing networks with transient and time varying conditions
N80-10833
STEWARD OBSERVATORY, TUCSON, ARIZ.
Near infrared photographic sky survey. 1: Catalog of red stellar objects
[NASA-CR-162386] N80-10978
SYSTEM DEVELOPMENT CORP., SANTA MONICA, CALIF.
The 10MW[e] solar thermal central receiver pilot plant: Heliostat foundation and interface structure investigation
[SAND-78-8198] N80-10612
Deductive planning and pathfinding for relational data bases
[AD-A070801] N80-10957
SYSTEMS CONTROL, INC., PALO ALTO, CALIF.
Radio navigation systems: Current status
N80-10153
SYSTEMS TECHNOLOGY, INC., HAWTHORNE, CALIF.
Manned engineering flight simulation validation, Part 1. Simulation requirements and simulator motion system performance
[AD-A071394] N80-10235
SYSTRAN CORP., DAYTON, OHIO.
MATE support software analysis
[AD-A070931] N80-10824

T

TECHNICOLOR GRAPHIC SERVICES, INC., HOUSTON, TEX.
Film exposure calculations
N80-10579
ASTP photographic film processing and sensitometric summary
N80-10580
TECHNION - ISRAEL INST. OF TECH., HAIFA.
Dynamic response of a slab of elastic-viscoplastic material that exhibits induced plastic anisotropy
[ISSN-0072-9310] N80-10513
TECHNISCHE HOGESCHOOL, DELFT [NETHERLANDS].
A simple method to estimate the influence of a small variation in the throat area on the performance of solid rockets
N80-10287
Low frequency oscillatory combustion: Experiments and results
N80-10305
TECHNOLOGY SERVICE CORP., SANTA MONICA, CALIF.
Statistical analysis of TSP and meteorological data in EPA region 6
[PB-296838/6] N80-10698
TELEDYNE RYAN AERONAUTICAL CO., SAN DIEGO, CALIF.
Study of the feasibility aspects of flight testing an aeroelastically tailored forward swept research wing on a BQM-34F drone vehicle
[NASA-CR-159149] N80-10195
TELEDYNE SYSTEMS CO., NORTHRIDGE, CALIF.
Application of GPS to low cost tactical weapons
N80-10174
TENNESSEE TECHNOLOGICAL UNIV., COOKEVILLE.
Use of wagner functions in airfoil design optimization
[AD-A072634] N80-10139
TERRA TEK, INC., SALT LAKE CITY, UTAH.
High-temperature strain instrumentation feasibility study
[AD-A072443] N80-10479
TEXAS A&M UNIV., COLLEGE STATION.
An incremental form of the single-integral nonlinear viscoelastic theory for elastic-plastic-creep finite element analysis
[AD-A072151] N80-10523
An investigation into the combined isotropic-kinematic workhardening rule
[AD-A072152] N80-10524

The application of thermal and creep effects to the combined isotropic-kinematic hardening model for inelastic structural analysis by the finite element method
[AD-A072053] N80-30525
TEXAS INSTRUMENTS, INC., DALLAS.
Texas instruments phase I GPS user equipment
N80-30549
TEXAS UNIV., AUSTIN.
Production and detection of new neutrinos
[DOE/ER-3992-346] N80-30882
Quantum electrodynamics and light rays
[DOE/ER-3992-354] N80-30949
TEXAS UNIV. AT ARLINGTON.
Cross flow fan experiment development and finite element modeling
N80-30898
The effect of point contact surface damage on the work hardening of copper crystals
N80-30379
TEXAS UNIV. AT AUSTIN.
Analysis of Skylab and aerip photographs of the Levantine [Dead Sea] fault zone
N80-30543
South American river morphology and hydrology
N80-30574
High intensity sound research, 1961-1978
[AD-A072530] N80-30860
TEXAS UNIV. AT DALLAS, RICHARDSON.
X-ray tomography by optical reconstruction from projections
N80-30903
TRACOR JITCO, INC., ROCKVILLE, MD.
A safety practices manual for the manufacturing, transportation, storage, and use of pyrotechnics
[PB-297807/0] N80-30399
TRENTON STATE COLL., N. J.
Analytical modeling of flash-back phenomena
[NASA-CR-162309] N80-30330
TRW DEFENSE AND SPACE SYSTEMS GROUP, REDONDO BEACH, CALIF.
Implications of possible shuttle charging
[NASA-CR-161203] N80-30277
TRW, INC., REDONDO BEACH, CALIF.
The 30/20 GHz mixed user architecture development study
[NASA-CR-159806] N80-30415
The 30/20 GHz mixed user architecture development study: Executive summary
[NASA-CR-159687] N80-30416
Emission assessment of conventional stationary combustion systems. Volume 2: Internal combustion sources
[PB-296390/8] N80-30656
TRW ENERGY SYSTEMS PLANNING DIV., MCLEAN, VA.
Methane recovery from coalbeds
[DOE/MC-08089-T1] N80-30387
TRW SYSTEMS, REDONDO BEACH, CALIF.
Self-calibrating threshold detector
[NASA-CASE-MSC-16370-1] N80-30413

U

ULTRASYSTEMS, INC., IRVINE, CALIF.
Compound oxidized styrylphosphine
[NASA-CASE-MSC-14905-2] N80-30358
UNIFIED INDUSTRIES, INC., ALEXANDRIA, VA.
Managerial plan: Executive order 12003 and the National Energy Act
[DOE/TIC-10067] N80-30965
UNION CARBIDE CORP., OAK RIDGE, TENN.
Modeling for moving boundary problems
[CONF-790345] N80-30843
UNION CARBIDE CORP., TARRYTOWN, N.Y.
Fluorodinitro silicon compounds and high energy elastomeric polymers
[AD-A072559] N80-30367
UNITED TECHNOLOGIES CORP., EAST HARTFORD, CONN.
Portable breathing system
[NASA-CASE-MSC-16182-1] N80-30799
UNITED TECHNOLOGIES CORP., SUNNYVALE, CALIF.
Pressure and velocity response function measurements by the rotating valve method
N80-30312
UNITED TECHNOLOGIES RESEARCH CENTER, EAST HARTFORD, CONN.
Development of silicon nitride of improved toughness
[NASA-CR-159676] N80-30319
UNIVERSIDADE ESTADUAL DE CAMPINAS [BRAZIL].
Effects of stoichiometry and neutron irradiation in superconducting A-15 compounds
[BNL-25960] N80-30944
UNIVERSITY OF EASTERN MICHIGAN, YPSILANTI.
Impact of Great Lakes water level fluctuations on coastal wetlands
[PB-296403/9] N80-30790
UNIVERSITY OF SOUTH FLORIDA, TAMPA.
The noise properties of thick film resistors
N80-30428
UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES.
Decision making, fuzzy set theory and computers
[AD-A071842] N80-30815
UNIVERSITY OF WESTERN KENTUCKY, BOWLING GREEN.
MSFC solar heating and cooling high speed performance [Hisper] code validation
[NASA-CR-161323] N80-30604
UTAH STATE UNIV., LOGAN.
A method of computer-aided generation of software for digital system controllers using fixed-instruction machines
N80-30812
UTAH UNIV., SALT LAKE CITY.
The effect of the duration of jet aircraft flyover sounds on judged annoyance
[NASA-CR-159132] N80-30859
Physical properties data compilations relevant to energy storage. 9: Engineering properties of single and polycrystalline sodium beta and beta-alumina
[PB-297847/6] N80-30946
UTAH WATER RESEARCH LAB., LOGAN.
Performance and upgrading of wastewater stabilization ponds
[PB-297504/3] N80-30977

V

VANDERBILT UNIV., NASHVILLE, TENN.
Properties of steady, viscosity stratified flow to a line sink
N80-30455
Dimuon production in 15.5 GeV/c pion p interactions
N80-30864
VIRGINIA INST. OF MARINE SCIENCE, GLOUCESTER POINT.
Offshore pipeline corridors and landfalls in coastal Virginia, volumes 1 and 2 and appendices
[PB-297439/2] N80-30708
VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.
Numerical simulation of dynamics of brushless dc motors for aerospace and other applications. Volume 1: Model development and applications, part A
[NASA-CR-160349] N80-30437
Unsteady laminar-flow separation in tubes. 2: The effect of variations in the frequency and amplitude of flow oscillations
[PB-296968/1] N80-30473
Vibration frequencies of an arch model under various loading conditions
[PB-297907/0] N80-30529
VIRGINIA UNIV., CHARLOTTESVILLE.
Linked and mercury-bridged nido-carboranes. High yield synthesis of mu, mu prime- [CH3] 2C2B4H5]2Hg, conversion to 5,5prime-[CH3] 2C2B4H52, cleavage, and oxidative addition of benzene. Synthesis of mu,mu prime-(5:5)[2]9g
[AD-A070777] N80-30333
Nickel boron hybrid clusters: Synthesis of polyhedral nickelaboranes and nickelacarboranes from small borane and carborane anion. Crystal structure of [eta5-C5H5]4N4B4H4
[AD-A070926] N80-30345
Experiments on the nuclear interactions of pions
[ORO-4043-38] N80-30881
VOUGHT CORP., DALLAS, TEX.
Augmenting ejector endwall effects
N80-30121

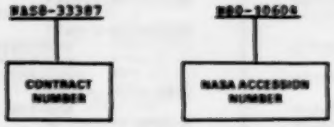
W

WASHINGTON SCIENTIFIC MARKETING, INC., WASHINGTON, D. C.
Department of Energy workshops on industrial energy conservation reporting
[DOE/CS-1830-T3] N80-30635
WASHINGTON STATE UNIV., PULLMAN.
Electropolymerization in stationary cells and in packed and fluidized bed electrode cells
N80-30360
Excitation of currents on infinite wires by vertical and horizontal electric dipoles in the presence of a dissipative Earth
N80-30430
Experimental determination and modeling of dry deposition for ozone
N80-30684
Immobilization of hazardous residuals by encapsulation
[PB-296642/2] N80-30897
Studies of chemical and mechanical surface phenomena by particle emission techniques
N80-30933
WASHINGTON UNIV., SEATTLE.
Hydrologic modeling and data requirements for analysis of urban streamflow management alternatives
[PB-296499/7] N80-30591
Life stress, self-preoccupation, and social supports
[AD-A068624] N80-30709
Transients in vibrational relaxation of polyatomic molecules at high temperatures by the variable encounter method
[AD-A070774] N80-30867
WATER PURIFICATION ASSOCIATES, CAMBRIDGE, MASS.
Wastewater treatment in coal conversion
[PB-297587/8] N80-30700
WAYNE STATE UNIV., DETROIT, MICH.
A model for auditory evoked potentials
N80-30780
WEST VIRGINIA UNIV., MORGANTOWN.
Influence of pumped storage flows on thermal stratification in reservoirs
[PB-297131/5] N80-30592
WESTGATE RESEARCH CORP., MARINA DEL REY, CALIF.
Investigation into the chemistry of the UV-ozone purification process
[PB-296485/6] N80-30337
WESTINGHOUSE ELECTRIC CORP., EDDYSTONE, PA.
Screening evaluation of novel power cycles integrated with gasification plants
[EPRI-AF-1002] N80-30605
WESTINGHOUSE ELECTRIC CORP., LIMA, OHIO.
Program for the development of a superconducting generator, phase 2 and 3
[AD-A072093] N80-30439
WESTINGHOUSE ELECTRIC CORP., PITTSBURGH, PA.
Stainless steel blanket concept for tokamaks
[WFPS-TME-79-010] N80-30919
WESTINGHOUSE ELECTRIC CORP., TRAFFORD, PA.
Sodium storage and injection system
[NASA-CASE-NPO-14384-1] N80-30494
WESTINGHOUSE RESEARCH AND DEVELOPMENT CENTER, PITTSBURGH, PA.
Performance monitoring of an off-peak heating and cooling system utilizing thermal storage and solar augmented heat pump
[EPRI-ER-845] N80-30642
WISCONSIN UNIV. - MADISON.
Pulmonary adaptation to high altitude
[AD-A068317] N80-30784
WISCONSIN UNIV. - MILWAUKEE.
Interaction of surface waves with thin nickel films
N80-30931
WISCONSIN UNIV., MADISON.
Production of hydrogen, deuterium, and helium by 15-MeV neutrons
[COO-2719-51] N80-30873
Fast magnetosonic wave heating of the NUWMAK tokamak reactor
[UWFDM-227] N80-30923
WISCONSIN UNIV. CENTER SYSTEM, RICE LAKE.
Energy and economic assessment of anaerobic digesters and biofuels for rural waste management
[PB-296523/4] N80-30398
WRIGHT STATE UNIV., DAYTON, OHIO.
Linearized unsteady jet analysis
N80-30118
Determination of constitutive equations for high strength Aluminum and Titanium alloys applicable to sheet metal formability
[AD-A072121] N80-30346

Y

YALE UNIV., NEW HAVEN, CONN.
An aptitude-strategy interaction in linear syllogistic reasoning
[AD-A068498] N80-30791

Typical Contract Number Index Listing



Listings in this index are arranged alphanumerically by contract number. Under each contract number the NASA accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order. The NASA accession number denotes the number by which the citation is identified.

AF PROJ. 627A
N80-10729
AF PROJ. 649L
N80-10417
AF PROJ. 1123
N80-10233
N80-10237
AF PROJ. 2003
N80-10234
AF PROJ. 2104
N80-10199
AF PROJ. 2303
N80-10332
AF PROJ. 2304
N80-10141
N80-10839
AF PROJ. 2305
N80-10420
N80-10438
AF PROJ. 2306
N80-10346
N80-10939
AF PROJ. 2307
N80-10139
N80-10143
N80-10229
N80-10348
N80-10422
N80-10518
N80-10860
AF PROJ. 2308
N80-10380
AF PROJ. 2311
N80-10712
AF PROJ. 2401
N80-10197
N80-10198
AF PROJ. 2419
N80-10365
AF PROJ. 2423
N80-10934
AF PROJ. 2646
N80-10736
AF PROJ. 3048
N80-10223
AF PROJ. 3145
N80-10439
AF PROJ. 3207
N80-10227
AF PROJ. 6096
N80-10909
AF PROJ. 7184
N80-10200
N80-10796
N80-10803
AF PROJ. 8809
N80-10201
AF-AFOSR-75-1798
N80-10254
AF-AFOSR-75-2796
N80-10839
AF-AFOSR-78-3524
N80-10141
AF-AFOSR-3005-76
N80-10226
AF-AFOSR-3104-76
N80-10294
AF-AFOSR-3252-77
N80-10386
AF-AFOSR-3282-77
N80-10143
AF-AFOSR-3321-77
N80-10963
AF-AFOSR-3525-78
N80-10118
AF-AFOSR-3543-78
N80-10139
AF-AFOSR-3554-78
N80-10910
ARPA ORDER 1827
N80-10714
ARPA ORDER 2204
N80-10792
ARPA ORDER 3206
N80-10805
ARPA ORDER 3705
N80-10802
AT(29-1)-789 N80-10616
CPSC-C-77-0091
N80-10783
DA PROJ. 1P2-62209-AH-76
N80-10228
DA PROJ. 1L1-61101-A-91A
N80-10818
DA PROJ. 1L1-62111-AH-71
N80-10730
DA PROJ. 1L2-62209-AH-76
N80-10136
DA PROJ. 1T1-61102-A-31B
N80-10935
DA PROJ. 1T1-66572-D-126
N80-10738
DA PROJ. 1T6-65702-D-126
N80-10720
N80-10721
N80-10722
N80-10723
N80-10726
N80-10727
N80-10733
DA PROJ. 2Q2-63743-A-772
N80-10236
DA PROJ. 3E1-61102-BS-08
N80-10784
DA-ERO-75-G-049
N80-10368
DAAG29-76-G-0027
N80-10815
DAAG29-77-C-0019
N80-10421
DAAG29-77-G-0152
N80-10418
DAAG46-78-C-0033
N80-10479
DAAG53-76-C-0138
N80-10805
DAAJ02-76-C-0035
N80-10228
DAEA18-76-C-0060
N80-10734
DABC19-76-C-0011
N80-10804
DAND17-77-C-7006
N80-10784
DAPPA ORDER 4019
N80-10489
DE-AE29-76-ET20370
N80-10594
DE-AC01-79EV-10018
N80-10701
DE-AC04-76DP-00789
N80-10184
N80-10892
DE-AC21-78BC-00089
N80-10387
DEN3-67 N80-10603
DREW-210-77-9165
N80-10399
DI-9-07-85-70022
N80-10741
DI-14-34-001-8051
N80-10591
DI-14-34-0001-6214
N80-10592
DI-14-34-0001-7160
N80-10703
DI-14-0001-7163
N80-10590
DOE-IA-49-551-75
N80-10527
DOE-IA-80-552-75
N80-10527
DOT-FR-11-8474
N80-10238
E(11-1)-2538 N80-10566
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E(49-1)-3443 N80-10840
EC-77-A-31-1034
N80-10622
EC-77-X-01-2752
N80-10383
EE-77-C-01-6119
N80-10629
EE-77-S-02-8497
N80-10690
EF-77-A-01-2593
N80-10344
EF-77-A-01-2674
N80-10595
EG-77-C-01-4024
N80-10657
EG-77-C-01-4042
N80-10663
EG-77-C-01-4049
N80-10659
EG-77-C-01-4101
N80-10389
N80-10393
N80-10394
EG-77-C-03-1590
N80-10654
EG-77-S-02-4257
N80-10878
EG-77-S-02-4479
N80-10655
EG-77-S-02-4546
N80-10652
N80-10653
N80-10656
EM-77-C-01-8962
N80-10965
EM-78-C-04-5319
N80-10660
EPA-R-800906 N80-10744
EPA-R-804457 N80-10398
EPA-R-804836 N80-10396
EPA-R-805842 N80-10977
EPA-68-02-2093
N80-10338
EPA-68-02-2197
N80-10696
EPA-68-02-2262
N80-10699
EPA-68-02-2607
N80-10704
EPA-68-02-2828
N80-10698
EPA-68-02-3001
N80-10706
EPA-68-03-2287
N80-10700
EPA-68-03-2550
N80-10707
EPA-12050-GXF
N80-10972
EPRI PROJ. 804
N80-10584
EPRI PROJ. 990-1
N80-10498
EPRI PROJ. 990-3
N80-10605
EPRI PROJ. 1082-1
N80-10622
EQ9AB499 N80-10396
ET-78-C-02-4710
N80-10923
EX-76-C-02-0016
N80-10481
EX-76-C-01-2286
N80-10392
EX-76-C-01-2337
N80-10634
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EX-76-C-01-2433
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EX-76-C-01-2499
N80-10390
EX-76-C-08-0789
N80-10466
N80-10481
EY-76-C-02-0016
N80-10323
N80-10356
N80-10468
N80-10480
N80-10624
N80-10633
N80-10651
N80-10691
N80-10922
N80-10941
N80-10948
EY-76-C-02-1198
N80-10940
EY-76-C-02-2482
N80-10945
EY-76-C-02-2857
N80-10628
EY-76-C-02-3090
N80-10870
N80-10871
EY-76-C-02-3073
N80-10448
EY-76-C-02-4094
N80-10639
EY-76-C-03-0511
N80-10952
EY-76-C-03-0515
N80-10423
N80-10856
N80-10883
N80-10896
EY-76-C-03-1123
N80-10615
EY-76-C-04-0613
N80-10442
EY-76-C-04-0789
N80-10336
N80-10351
N80-10370
N80-10384
N80-10501
N80-10528
N80-10608
N80-10609
N80-10612
N80-10616
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N80-10640
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N80-10797
N80-10884

CONTRACT

NBO-10093
NBO-10916
NBO-10959
NBO-10971
EY-76-C-06-1030
NBO-10382
NBO-10613
NBO-10625
EY-76-C-07-1570
NBO-10469
NBO-10482
NBO-10580
NBO-10661
NBO-10889
EY-76-C-09-0001
NBO-10888
EY-76-C-10-1270
NBO-10614
EY-76-S-02-2200
NBO-10920
EY-76-S-02-2385
NBO-10943
EY-76-S-02-2490
NBO-10872
EY-76-S-02-2719
NBO-10873
EY-76-S-02-2874
NBO-10844
EY-76-S-03-0326-030
NBO-10855
EY-76-S-05-3992
NBO-10882
NBO-10949
EY-76-S-05-4043
NBO-10881
EY-76-S-05-4081
NBO-10868
EY-76-S-05-5126
NBO-10842
EY-76-S-09-0889
NBO-10792
EY-76-S-09-0936
NBO-10742
EY-77-C-06-1001
NBO-10891
EY-77-C-06-1036
NBO-10504
EY-77-C-1030 NBO-10504
F04701-78-C-0079
NBO-10331
F04611-72-C-0007
NBO-10312
F04611-74-74-C-0045
NBO-10312
F04701-78-C-0079
NBO-10462
F08635-76-C-0343
NBO-10174
F19628-76-C-0069
NBO-10729
F19628-77-C-0060
NBO-10939
F19628-77-C-0125
NBO-10420
F19628-78-C-0002
NBO-10417
F19628-78-C-0078
NBO-10712
F30602-76-C-0054
NBO-10736
F33615-71-C-1591
NBO-10439
F33615-76-C-1280
NBO-10909
F33615-76-C-2020
NBO-10223
F33615-76-C-3145
NBO-10518
F33615-77-C-2065
NBO-10235
F33615-77-C-3013
NBO-10227
NBO-10229
NBO-10422
F33615-77-C-3050
NBO-10197
NBO-10198
F33615-77-C-5059
NBO-10346
F33615-77-C-5142
NBO-10934
F33615-77-C-5260
NBO-10346
F33615-77-D-1042
NBO-10824
F33615-78-C-0508
NBO-10803
F41608-76-D-A005
NBO-10503
F41608-77-D-A021
NBO-10503
F49620-75-C-0064
NBO-10714
F49620-76-C-0040
NBO-10860
F49620-76-C-0100
NBO-10438
F49620-77-C-0048
NBO-10312
F49620-77-C-0075
NBO-10332
F49620-79-C-0196
NBO-10513
JPL-954373 NBO-10598
JPL-954471 NBO-10597
JPL-955116 NBO-10596
MDA903-79-C-0261
NBO-10802
NASA ORDER L-75242A
NBO-10103
NASW-2781 NBO-10962
NASW-3047 NBO-10852
NASW-3198 NBO-10265
NBO-10317
NBO-10478
NBO-10686
NBO-10813
NBO-10866
NBO-10981
NBO-10982
NBO-10989
NBO-10990
NASW-3199 NBO-10104
NBO-10273
NBO-10435
NBO-10459
NBO-10477
NBO-10497
NBO-10745
NBO-10914
NBO-10915
NBO-10983
NBO-10988
NBO-10991
NASW-3205 NBO-10986
NAS1-13129 NBO-10713
NAS1-14948 NBO-10149
NAS1-15238 NBO-10834
NAS1-15624 NBO-10195
NAS1-15629 NBO-10476
NAS3-17866 NBO-10204
NBO-10220
NAS3-20088 NBO-10318
NAS3-20602 NBO-10221
NAS3-20632 NBO-10515
NAS3-21135 NBO-10134
NAS3-21375 NBO-10319
NAS3-21389 NBO-10222
NAS3-21581 NBO-10460
NAS3-21933 NBO-10415
NBO-10416
NAS4-2460 NBO-10276
NAS5-22948 NBO-10566
NBO-10569
NAS7-100 NBO-10240
NBO-10301
NBO-10597
NAS8-31353 NBO-10266
NBO-10267
NBO-10268
NAS8-32093 NBO-10601
NBO-10602
NAS8-32365 NBO-10514
NAS8-32580 NBO-10277
NAS8-33387 NBO-10604
NAS8-33608 NBO-10379
NAS9-13831 NBO-10538
NAS9-14952 NBO-10224
NAS9-15091 NBO-10437
NAS9-15218 NBO-10800
NAS9-15267 NBO-10801
NAS9-15543 NBO-10836
NAS9-15584 NBO-10782
NAS9-15755 NBO-10600
NAS9-15795 NBO-10275
NGL-16-001-043
NBO-10713
NGL-22-009-124
NBO-10814
NGR-33-010-186
NBO-10457
NBO-10979
NBO-10980
NGR-47-005-219
NBO-10126
NOAA-04-7-158-44041
NBO-10708
NOAA-04-7-158-44126
NBO-10742
NP PROJ. 047-040
NBO-10820
NBO-10821
NP PROJ. 051-616
NBO-10486
NR PROJ. 053-569
NBO-10333
NR PROJ. 092-549
NBO-10867
NP PROJ. 150-412
NBO-10791
NR PROJ. 154-387
NBO-10792
NR PROJ. 170-804
NBO-10789
NR PROJ. 197-040
NBO-10795
NR PROJ. 201-052
NBO-10790
NR PROJ. 356-504
NBO-10363
NSF AER-76-06168
NBO-10675
NSF AST-78-20708
NBO-10457
NBO-10979
NBO-10980
NSF ATM-76-10424
NBO-10457
NBO-10979
NBO-10980
NSF ATM-77-23757
NBO-10719
NSF DCR-75-04060
NBO-10826
NSF ENG-74-20142
NBO-10473
NSF ENG-76-22720
NBO-10271
NSF ENG-77-17847
NBO-10529
NSF ENV-76-06583
NBO-10897
NSF ENV-77-10199
NBO-10976
NSF MCS-76-12026
NBO-10820
NBO-10821
NSF MSC-76-12026
NBO-10837
NSF SOC-76-05837
NBO-10963
NSF 7522488 NBO-10126
NSG-1272 NBO-10859
NSG-1394 NBO-10711
NSG-1433 NBO-10687
NSG-1453 NBO-10461
NSG-2149 NBO-10148
NSG-2245 NBO-10137
NSG-3180 NBO-10330
NSG-7523 NBO-10231
N00014-75-C-0661
NBO-10826
N00014-68-C-0296
NBO-10790
N00014-72-C-0153
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N00014-75-C-0305
NBO-10333
NBO-10345
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NBO-10838
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NBO-10519
N00014-75-C-0621
NBO-10820
NBO-10821
NBO-10837
N00014-75-C-0690
NBO-10867
N00014-75-C-0739
NBO-10937
NBO-10938
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NBO-10367
N00014-75-C-0905
NBO-10789
N00014-76-C-0016
NBO-10987
N00014-76-C-0150
NBO-10523
NBO-10524
NBO-10525
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NBO-10363
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NBO-10847
NBO-10848
NBO-10849
NBO-10850
N00014-76-C-0628
NBO-10792
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NBO-10819
N00014-76-C-0745
NBO-10486
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NBO-10957
N00014-76-C-1047
NBO-10369
N00014-77-C-0005
NBO-10463
N00014-77-C-0032
NBO-10142
N00014-77-C-0114
NBO-10794
N00014-77-C-0158
NBO-10825
N00014-77-C-0271
NBO-10112
N00014-77-C-0615
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N00014-78-C-0025
NBO-10791
N00014-78-C-0128
NBO-10140
N00014-78-C-0164
NBO-10582
NBO-10823
N00014-78-C-0204
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N00014-78-C-0256
NBO-10936
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NBO-10320
NBO-10321
NBO-10322
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NBO-10465
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NBO-10808

N00173-78-C-0192
N80-10487
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N80-10189
N80-10191
N62269-76-C-0402
N80-10122
N62269-77-C-0412
N80-10115
R-904207 N80-10793
RR0141104 N80-10140
R802103046 N80-10936
SP1311332307 N80-10298
SRI PROJ. PYU-6980
N80-10597
S-OP-IONA-79-2
N80-10713
W-31-109-ENG-38
N80-10353
N80-10502
N80-10585
N80-10606
N80-10632
N80-10828
N80-10829
N80-10917
N80-10918
N80-10953
N80-10954
W-7405-ENG-26
N80-10354
N80-10355
N80-10357
N80-10499
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N80-10876
N80-10890
N80-10945
N80-10950
N80-10960
W-7405-ENG-36
N80-10335
N80-10352
N80-10381
N80-10443
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N80-10470
N80-10472
N80-10491
N80-10492
N80-10637
N80-10646
N80-10649
N80-10715
N80-10716
N80-10841
N80-10851
N80-10875
N80-10886
N80-10911
N80-10912
N80-10951
N80-10984
W-7405-ENG-48
N80-10279
N80-10385
N80-10424
N80-10440
N80-10471
N80-10483
N80-10490
N80-10493
N80-10526
N80-10611
N80-10619
N80-10623
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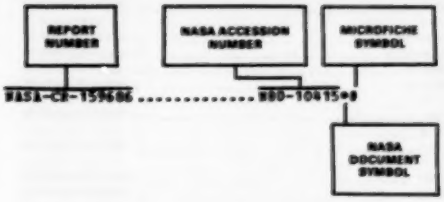
N80-10648
N80-10664
N80-10688
N80-10689
N80-10717
N80-10739
N80-10798
N80-10827
N80-10831
N80-10846
N80-10857
N80-10869
N80-10877
N80-10887
N80-10894
N80-10895
N80-10942
N80-10955
N80-10970
W-7405-ENG-82
N80-10811
N80-10874
W-7405-ENG-92
N80-10395
W-7406-ENG-48
N80-10621
WF51523000 N80-10783
XF11121200 N80-10862
146-20-10-07 N80-10685
505-02-21 N80-10516
505-02-33-02 N80-10512
505-06-63-02 N80-10225
505-09-43-01 N80-10193
505-10-31 N80-10107
505-11-13-02 N80-10101
505-31-83-02 N80-10854
506-51-13-01 N80-10458
513-52-13-52 N80-10152
517-53-43-01 N80-10135
517-53-43-03 N80-10102
750-02-01-05 N80-10433
778-17-01 N80-10603

REPORT / ACCESSION NUMBER INDEX

Typical Report/Accession Number Index Listing



Listings in this index are arranged alphanumerically by report number. The NASA accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

A-7887 ..... N80-10107*#

AD-A066132 ..... N80-10788 #
AD-A066220 ..... N80-10151 #
AD-A066320 ..... N80-10230 #
AD-A068201 ..... N80-10793 #
AD-A068317 ..... N80-10784 #
AD-A068323 ..... N80-10792 #
AD-A068475 ..... N80-10233 #
AD-A068480 ..... N80-10783 #
AD-A068498 ..... N80-10791 #
AD-A068562 ..... N80-10790 #
AD-A068624 ..... N80-10789 #
AD-A070241 ..... N80-10714 #
AD-A070539 ..... N80-10935 #
AD-A070549 ..... N80-10726 #
AD-A070556 ..... N80-10725 #
AD-A070557 ..... N80-10724 #
AD-A070558 ..... N80-10723 #
AD-A070559 ..... N80-10722 #
AD-A070571 ..... N80-10138 #
AD-A070669 ..... N80-10365 #
AD-A070671 ..... N80-10417 #
AD-A070707 ..... N80-10721 #
AD-A070732 ..... N80-10903 #
AD-A070774 ..... N80-10867 #
AD-A070777 ..... N80-10333 #
AD-A070786 ..... N80-10153 #
AD-A070789 ..... N80-10794 #
AD-A070795 ..... N80-10713*#
AD-A070796 ..... N80-10380 #
AD-A070801 ..... N80-10957 #
AD-A070814 ..... N80-10728 #
AD-A070830 ..... N80-10727 #
AD-A070904 ..... N80-10732 #
AD-A070926 ..... N80-10345 #
AD-A070931 ..... N80-10824 #
AD-A070940 ..... N80-10199 #
AD-A070946 ..... N80-10729 #
AD-A070947 ..... N80-10712 #
AD-A070956 ..... N80-10737 #
AD-A070997 ..... N80-10332 #
AD-A071044 ..... N80-10331 #
AD-A071091 ..... N80-10963 #
AD-A071094 ..... N80-10934 #
AD-A071124 ..... N80-10582 #
AD-A071150 ..... N80-10364 #
AD-A071151 ..... N80-10486 #
AD-A071176 ..... N80-10730 #
AD-A071207 ..... N80-10802 #
AD-A071282 ..... N80-10334 #
AD-A071313 ..... N80-10234 #
AD-A071319 ..... N80-10200 #
AD-A071322 ..... N80-10228 #
AD-A071334 ..... N80-10822 #
AD-A071335 ..... N80-10733 #
AD-A071338 ..... N80-10419 #
AD-A071377 ..... N80-10320 #
AD-A071390 ..... N80-10321 #
AD-A071398 ..... N80-10235 #
AD-A071425 ..... N80-10720 #
AD-A071437 ..... N80-10909 #
AD-A071438 ..... N80-10519 #
AD-A071447 ..... N80-10939 #
AD-A071452 ..... N80-10734 #
AD-A071463 ..... N80-10834 #
AD-A071474 ..... N80-10420 #
AD-A071603 ..... N80-10805 #
AD-A071617 ..... N80-10347 #
AD-A071625 ..... N80-10746 #
AD-A071638 ..... N80-10807 #
AD-A071647 ..... N80-10808 #
AD-A071649 ..... N80-10518 #
AD-A071662 ..... N80-10226 #
AD-A071663 ..... N80-10936 #
AD-A071664 ..... N80-10421 #
AD-A071732 ..... N80-10937 #
AD-A071733 ..... N80-10938 #
AD-A071749 ..... N80-10198 #
AD-A071795 ..... N80-10816 #
AD-A071805 ..... N80-10992 #
AD-A071842 ..... N80-10815 #
AD-A071843 ..... N80-10418 #
AD-A071895 ..... N80-10197 #
AD-A071972 ..... N80-10806 #
AD-A072014 ..... N80-10817 #
AD-A072044 ..... N80-10738 #
AD-A072050 ..... N80-10809 #
AD-A072054 ..... N80-10349 #
AD-A072066 ..... N80-10422 #
AD-A072067 ..... N80-10350 #
AD-A072073 ..... N80-10522 #
AD-A072075 ..... N80-10363 #
AD-A072076 ..... N80-10438 #
AD-A072077 ..... N80-10838 #
AD-A072079 ..... N80-10731 #
AD-A072093 ..... N80-10439 #
AD-A072097 ..... N80-10503 #
AD-A072098 ..... N80-10143 #
AD-A072110 ..... N80-10366 #
AD-A072121 ..... N80-10346 #
AD-A072132 ..... N80-10850 #
AD-A072133 ..... N80-10849 #
AD-A072134 ..... N80-10848 #
AD-A072144 ..... N80-10369 #
AD-A072145 ..... N80-10735 #
AD-A072147 ..... N80-10229 #
AD-A072151 ..... N80-10523 #
AD-A072152 ..... N80-10524 #
AD-A072153 ..... N80-10525 #
AD-A072159 ..... N80-10847 #
AD-A072199 ..... N80-10521 #
AD-A072247 ..... N80-10201 #
AD-A072258 ..... N80-10227 #
AD-A072273 ..... N80-10404 #
AD-A072274 ..... N80-10861 #
AD-A072277 ..... N80-10322 #
AD-A072297 ..... N80-10796 #
AD-A072301 ..... N80-10142 #
AD-A072309 ..... N80-10862 #
AD-A072312 ..... N80-10958 #
AD-A072317 ..... N80-10236 #
AD-A072347 ..... N80-10348 #
AD-A072359 ..... N80-10489 #
AD-A072379 ..... N80-10736 #
AD-A072394 ..... N80-10826 #
AD-A072402 ..... N80-10804 #
AD-A072416 ..... N80-10520 #
AD-A072442 ..... N80-10464 #
AD-A072443 ..... N80-10479 #
AD-A072457 ..... N80-10837 #
AD-A072458 ..... N80-10820 #
AD-A072459 ..... N80-10821 #
AD-A072471 ..... N80-10818 #
AD-A072473 ..... N80-10583 #
AD-A072486 ..... N80-10462 #
AD-A072505 ..... N80-10488 #

AD-A072517 ..... MBD-10823 0
AD-A072523 ..... MBD-10141 0
AD-A072539 ..... MBD-10487 0
AD-A072547 ..... MBD-10825 0
AD-A072548 ..... MBD-10465 0
AD-A072550 ..... MBD-10860 0
AD-A072552 ..... MBD-10819 0
AD-A072557 ..... MBD-10223 0
AD-A072559 ..... MBD-10367 0
AD-A072566 ..... MBD-10463 0
AD-A072578 ..... MBD-10810 0
AD-A072590 ..... MBD-10839 0
AD-A072612 ..... MBD-10237 0
AD-A072615 ..... MBD-10368 0
AD-A072630 ..... MBD-10140 0
AD-A072634 ..... MBD-10139 0
AD-A072637 ..... MBD-10910 0
AD-A072657 ..... MBD-10795 0
AD-A072660 ..... MBD-10196 0

AD-E200312 ..... MBD-10201 0

AES-425 ..... MBD-10400 0

AFAL-TR-78-107 ..... MBD-10909 0
AFAL-TR-78-166 ..... MBD-10824 0
AFAL-TR-79-1081 ..... MBD-10234 0

AFAPL-TR-79-2012 ..... MBD-10439 0
AFAPL-TR-79-2037 ..... MBD-10223 0
AFAPL-TR-79-2048 ..... MBD-10464 0
AFAPL-TR-79-2052 ..... MBD-10822 0

AFFDL-TR-78-3045-VOL-2 ..... MBD-10198 0

AFFDL-TR-78-84 ..... MBD-10229 0
AFFDL-TR-78-85 ..... MBD-10227 0
AFFDL-TR-78-86 ..... MBD-10422 0
AFFDL-TR-78-192-PT-1 ..... MBD-10235 0
AFFDL-TR-79-3023 ..... MBD-10141 0
AFFDL-TR-79-3038 ..... MBD-10518 0
AFFDL-TR-79-3045-VOL-1 ..... MBD-10197 0

AFGL-TR-79-0024 ..... MBD-10712 0
AFGL-TR-79-0084 ..... MBD-10729 0

AFHRL-TR-78-92 ..... MBD-10233 0
AFHRL-TR-79-18 ..... MBD-10237 0

AFIT-LSSR-23-79A MBD-10196 0

AFML-TR-78-64 ..... MBD-10365 0
AFML-TR-78-136 ..... MBD-10348 0
AFML-TR-79-4036 ..... MBD-10934 0
AFML-TR-79-4042 ..... MBD-10346 0

AFOSR-78-1434TR MBD-10839 0
AFOSR-79-0687TR MBD-10714 0
AFOSR-79-0737TR MBD-10332 0
AFOSR-79-0753TR MBD-10963 0
AFOSR-79-0868TR MBD-10143 0
AFOSR-79-0903TR MBD-10139 0
AFOSR-79-0904TR MBD-10910 0
AFOSR-79-0906TR MBD-10860 0
AFOSR-79-0981TR MBD-10438 0

AFRPL-TR-78-61 ..... MBD-10380 0

AFWL-TR-78-187 ..... MBD-10201 0

AGARD-AG-225 ..... MBD-10536 0
AGARD-AG-235-VOL-2 ..... MBD-10961 0
AGARD-AG-243 ..... MBD-10683 0
AGARD-AG-245 ..... MBD-10154 0

AGARD-AR-140 ..... MBD-10238 0
AGARD-AR-145 ..... MBD-10147 0
AGARD-AR-151 ..... MBD-10280 0
AGARD-AR-155A MBD-10203 0
AGARD-AR-156 ..... MBD-10202 0

AGARD-CP-259 ..... MBD-10281 0

AGARD-R-680 ..... MBD-10532 0

AIRRESEARCH-21-3239 ..... MBD-10522 0

ALO-5319-2 ..... MBD-10660 0

AMRDC-RS-79-3 ..... MBD-10521 0

AMRDC-TR-79-30 ..... MBD-10479 0

AMRL-TR-78-122 ..... MBD-10200 0
AMRL-TR-79-28 ..... MBD-10803 0
AMRL-TR-79-53 ..... MBD-10796 0

ANL-AMD-TM-320-REV-1 ..... MBD-10828 0

ANL-79-3 ..... MBD-10953 0

ANL/CES/TE-78-7 ..... MBD-10502 0
ANL/FPP/TM-119 ..... MBD-10918 0
ANL/LBP/TM-7 ..... MBD-10585 0
ANL/RER/78-3 ..... MBD-10829 0

APB-1 ..... MBD-10690 0

AR-16 ..... MBD-10794 0

ARI-RR-168 ..... MBD-10332 0
ARI-RR-1209 ..... MBD-10236 0

ARI-TP-379 ..... MBD-10958 0

ARI-TR-357 ..... MBD-10804 0

ARL-TR-79-36 ..... MBD-10860 0

ARO-12494.12-M MBD-10815 0
ARO-14808.2-EL MBD-10418 0
ARO-15950.3-A-EL MBD-10816 0

ASA-78-96 ..... MBD-10616 0

ASL-CR-79-0060-1 ..... MBD-10734 0

AVS-TR-79/001-VOL-2 ..... MBD-10731 0

BDM/W-79-008 ..... MBD-10737 0
BDM/W-79-548-TR MBD-10379*0

BDI-613-1942-REV MBD-10442 0

BFD-0-79-001 ..... MBD-10103*0

BNL-NUREG-25616 ..... MBD-10468 0
BNL-NUREG-25635 ..... MBD-10922 0

BNL-24911 ..... MBD-10624 0
BNL-24973 ..... MBD-10480 0
BNL-25043 ..... MBD-10691 0
BNL-25396 ..... MBD-10323 0
BNL-25909 ..... MBD-10651 0
BNL-25940 ..... MBD-10944 0
BNL-26016 ..... MBD-10441 0
BNL-26045 ..... MBD-10633 0
BNL-26072 ..... MBD-10941 0
BNL-26132 ..... MBD-10356 0

BR70073 ..... MBD-10436 0
BR70094 ..... MBD-10517 0
BR70095 ..... MBD-10232 0

CARP-TR-046 ..... MBD-10500 0

CAES-513-78 ..... MBD-10690 0

CEEDO-TR-78-39 ..... MBD-10199 0

CERL-TR-E-153-VOL-2 ..... MBD-10404 0

CERL-TR-N-258 ..... MBD-10349 0

CGR/DC-8/79 ..... MBD-10583 0

CISR-P010-7905-09 ..... MBD-10808 0

CISR-TR-9 ..... MBD-10808 0

COM-74-1083 ..... MBD-10325 0
COM-74-10242 ..... MBD-10531 0

CONF-780380 ..... MBD-10613 0
CONF-780579 ..... MBD-10490 0
CONF-780727-1 ..... MBD-10586 0
CONF-780826 ..... MBD-10887 0

CONF-780826-9 ..... NBS-10871 *
CONF-780926-10 ..... NBS-10870 *
CONF-780828 ..... NBS-10831 *
CONF-780843-5 ..... NBS-10693 *
CONF-780938-3 ..... NBS-10715 *
CONF-780945 ..... NBS-10830 *
CONF-780970-4 ..... NBS-10856 *
CONF-780983-2 ..... NBS-10624 *
CONF-780990-1 ..... NBS-10960 *
CONF-781061-P2 ..... NBS-10846 *
CONF-781067-2 ..... NBS-10381 *
CONF-781067-3 ..... NBS-10959 *
CONF-781082 ..... NBS-10716 *
CONF-781095-6 ..... NBS-10896 *
CONF-781101-1 ..... NBS-10747 *
CONF-781105-49 ..... NBS-10873 *
CONF-781105-68 ..... NBS-10499 *
CONF-781105-76 ..... NBS-10888 *
CONF-781109-8 ..... NBS-10609 *
CONF-781126-1 ..... NBS-10691 *
CONF-781130-3 ..... NBS-10480 *
CONF-781133 ..... NBS-10685 *
CONF-781133-3 ..... NBS-10608 *
CONF-781146-1 ..... NBS-10797 *
CONF-781202 ..... NBS-10528 *
CONF-781208 ..... NBS-10686 *
CONF-781243-1 ..... NBS-10875 *
CONF-790102 ..... NBS-10279 *
CONF-790125-50 ..... NBS-10355 *
CONF-790125-53 ..... NBS-10354 *
CONF-790148-1 ..... NBS-10984 *
CONF-790301-11 ..... NBS-10954 *
CONF-790305-6 ..... NBS-10639 *
CONF-790327 ..... NBS-10869 *
CONF-790327-100 ..... NBS-10917 *
CONF-790327-123 ..... NBS-10423 *
CONF-790328-4 ..... NBS-10651 *
CONF-790337-4 ..... NBS-10391 *
CONF-790341-7 ..... NBS-10353 *
CONF-790342-1 ..... NBS-10945 *
CONF-790345 ..... NBS-10843 *
CONF-790347-6 ..... NBS-10894 *
CONF-790420-10 ..... NBS-10890 *
CONF-790420-11 ..... NBS-10940 *
CONF-790430-14 ..... NBS-10892 *
CONF-790438-1 ..... NBS-10876 *
CONF-790442-2 ..... NBS-10351 *
CONF-790445-1 ..... NBS-10688 *
CONF-790485-3 ..... NBS-10694 *
CONF-790459-4 ..... NBS-10632 *
CONF-790518-5 ..... NBS-10370 *
CONF-790518-6 ..... NBS-10501 *
CONF-790520 ..... NBS-10385 *
CONF-790524-2 ..... NBS-10941 *
CONF-790527-2 ..... NBS-10441 *
CONF-790530-1 ..... NBS-10661 *
CONF-790541-2 ..... NBS-10638 *
CONF-790541-5 ..... NBS-10649 *
CONF-790602-6 ..... NBS-10468 *
CONF-790602-14 ..... NBS-10922 *
CONF-790602-32 ..... NBS-10919 *
CONF-790607-1 ..... NBS-10717 *
CONF-790611-1 ..... NBS-10467 *
CONF-790611-3 ..... NBS-10637 *
CONF-790619 ..... NBS-10841 *
CONF-790632-3 ..... NBS-10144 *
CONF-790636-1 ..... NBS-10633 *
CONF-790662 ..... NBS-10440 *
CONF-790803-3 ..... NBS-10663 *
CONF-790803-17 ..... NBS-10664 *
CONF-790808 ..... NBS-10642 *
CONF-7804122-1 ..... NBS-10951 *
CONF-7808102 ..... NBS-10665 *
CONF-7808104-1 ..... NBS-10611 *
CONF-7809141-1 ..... NBS-10621 *
CONF-7810165 ..... NBS-10971 *
CONF-7810167-1 ..... NBS-10621 *
CONF-7810178-1 ..... NBS-10323 *

CONTRIB-SER-A-3 ..... NBS-10978**

COO-1198-1261 ..... NBS-10940 *
COO-2200-10 ..... NBS-10920 *
COO-2305-6 ..... NBS-10943 *
COO-2482-10 ..... NBS-10845 *
COO-2490-9 ..... NBS-10872 *
COO-2719-5 ..... NBS-10873 *
COO-2874-38 ..... NBS-10844 *
COO-4094-31 ..... NBS-10639 *
COO-4257-3 ..... NBS-10878 *
COO-4479-2 ..... NBS-10655 *
COO-4497-1 ..... NBS-10690 *
COO-4546-1 ..... NBS-10652 *
COO-4546-8 ..... NBS-10653 *
COO-4546-9 ..... NBS-10656 *

CRC-APRAC-CAPM-22-75 ..... NBS-10786 *

CRSR-730 ..... NBS-10957**
CRSR-731 ..... NBS-10979**
CRSR-732 ..... NBS-10980**

CSB-IR-28 ..... NBS-10838 *

DELNV-TR-79-1 ..... NBS-10488 *
DELNV-TR-0003 ..... NBS-10935 *

DET-113T-1 ..... NBS-10378**

DOE/CS-1830-T3 ..... NBS-10635 *
DOE/EIA-0102/S2 ..... NBS-10620 *
DOE/EIA-0103/8 ..... NBS-10607 *
DOE/ER-03443-79 ..... NBS-10840 *
DOE/ERD-0022 ..... NBS-10631 *
DOE/EV-0035 ..... NBS-10630 *
DOE/HEB/EPA-03 ..... NBS-10701 *
DOE/JPL-954373-79/11 ..... NBS-10598**
DOE/JPL-954471-79/11 ..... NBS-10597**
DOE/MC-08089-21 ..... NBS-10387 *
DOE/NASA-2674-79/7 ..... NBS-10595**
DOE/NASA/0067-79-2 ..... NBS-10603**
DOE/NASA/2593-79/7 ..... NBS-10384**
DOE/NASA/20370-79/17 ..... NBS-10594**
DOE/TIC-4585-R1-SUPPL-1 ..... NBS-10617 *
DOE/TIC-10067 ..... NBS-10965 *
DOE/TIC-10103 ..... NBS-10606 *
DOE/TIC-10109 ..... NBS-10618 *
DOE/TIC-10118 ..... NBS-10644 *

DP-MS-78-59 ..... NBS-10888 *

DRDMI-T-78-53 ..... NBS-10807 *

DSN-PR-42-53 ..... NBS-10260**

DT-7832-10 ..... NBS-10463 *

E-079 ..... NBS-10205**
E-087 ..... NBS-10598**
E-090 ..... NBS-10384**
E-159 ..... NBS-10595**

ECOM-DR-990 ..... NBS-10728 *
ECOM-DR-992 ..... NBS-10724 *
ECOM-DR-995 ..... NBS-10725 *
ECOM-DR-996 ..... NBS-10727 *
ECOM-DR-999 ..... NBS-10722 *
ECOM-DR-1002 ..... NBS-10726 *
ECOM-DR-1003 ..... NBS-10721 *
ECOM-DR-1004 ..... NBS-10723 *

EISL/A3088 ..... NBS-10510**

EMD-78-68 ..... NBS-10679 *
EMD-79-68 ..... NBS-10678 *

EPA-450/2-79-001B ..... NBS-10705 *
EPA-600/2-79-057 ..... NBS-10699 *
EPA-600/2-79-066 ..... NBS-10972 *
EPA-600/2-79-087 ..... NBS-10707 *
EPA-600/3-79-061 ..... NBS-10744 *
EPA-600/4-79-029 ..... NBS-10338 *
EPA-600/4-79-031 ..... NBS-10702 *
EPA-600/7-78-174 ..... NBS-10398 *
EPA-600/7-79-029C ..... NBS-10696 *
EPA-600/7-79-043C ..... NBS-10704 *
EPA-600/7-89-133 ..... NBS-10700 *
EPA-600/9-79-011 ..... NBS-10977 *
EPA-906/9-79-005 ..... NBS-10698 *
EPA-907/9-79-002 ..... NBS-10974 *

EPRI-AP-911 ..... NBS-10498 *
EPRI-AP-1002 ..... NBS-10605 *

EPRI-EA-674 ..... NBS-10584 *
EPRI-EA-1018 ..... NBS-10692 *

EPRI-EM-1005 ..... NBS-10628 *

EPRI-ER-1037-VOL-2 ..... PB80-10622*#

EPRI-ER-845 ..... NTIS-10662 #
EPRI-ER-979 ..... PB80-10610 #

ERADCOM/ASL-DR-1007 ..... PB80-10733 #
ERADCOM/ASL-DR-1012 ..... PB80-10720 #
ERADCOM/ASL-DR-1018 ..... PB80-10738 #
ERADCOM/ASL-TR-0032 ..... PB80-10730 #

ERT-P-1996P ..... PB80-10729 #

ESA-SLP/2104-2-ISSN-1 ..... PB80-10272*#

ESD-TDBL-1104 ..... PB80-10739 #
ESD-TDBL-1220 ..... PB80-10950 #
ESD-TDBL-1254 ..... PB80-10747 #

ESD-TR-78-362 ..... PB80-10417 #

ESDD-78027 ..... PB80-10895
ESDD-79003 ..... PB80-10341
ESDD-79006 ..... PB80-10897

FAA-AM-78-26 ..... PB80-10708 #
FAA-AM-79-4 ..... PB80-10151 #

FAA-ATP-79-1 ..... PB80-10153 #

FAA-RD-79-4-VOL-1 ..... PB80-10230 #

FE-2447-13 ..... PB80-10388 #
FE-2489-33 ..... PB80-10390 #

FSD-STATISTICS-8502 ..... PB80-10850 #
FSD-STATISTICS-8505 ..... PB80-10849 #
FSD-STATISTICS-8506 ..... PB80-10848 #
FSD-STATISTICS-8509 ..... PB80-10847 #

FU470-FR ..... PB80-10909 #

GCA-TR-78-26-G ..... PB80-10704 #

GPO-36-211 ..... PB80-10599 #
GPO-50-365 ..... PB80-10274 #
GPO-51-336 ..... PB80-10964 #

GSTR-79-8 ..... PB80-10711*#

H-1095 ..... PB80-10276*#

HCP/CR4101 ..... PB80-10389 #
HCP/CR6119-F ..... PB80-10629 #
HCP/E2752-01 ..... PB80-10383 #
HCP/R4024-01/14 ..... PB80-10657 #
HCP/T2286-01 ..... PB80-10392 #
HCP/T4101-01 ..... PB80-10394 #
HCP/T4101-03 ..... PB80-10393 #

HEML-TR2-78-27 ..... PB80-10614 #

HOBEYWELL-F3437-QR-101 ..... PB80-10602*#

IAE-3100 ..... PB80-10921 #

ICAP-1089 ..... PB80-10511 #

ICP-1183 ..... PB80-10889 #

IFSR-79-90 ..... PB80-10519 #

IIHR-79/06 ..... PB80-10705 #
IIHR-79/09 ..... PB80-10697 #

IS-T-830 ..... PB80-10811 #

IS-4516 ..... PB80-10674 #

ISBN-0-309-02874-4 ..... PB80-10677 #
ISBN-0-85679-231-4 ..... PB80-10495
ISBN-0-85679-250-0 ..... PB80-10341
ISBN-0-85679-251-9 ..... PB80-10097
ISBN-92-835-0243-4 ..... PB80-10281 #
ISBN-92-835-1318-5 ..... PB80-10536 #
ISBN-92-835-1326-6 ..... PB80-10683 #
ISBN-92-835-1330-4 ..... PB80-10154 #
ISBN-92-835-1334-7 ..... PB80-10147 #
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ISBN-92-835-1336-3 ..... PB80-10203 #

ISBN-92-835-1338-X ..... PB80-10238 #

ISSN-0072-9310 ..... PB80-10513 #
ISSN-0141-397X PB80-10097
ISSN-0141-2590 ..... PB80-10495
ISSN-0141-3996 ..... PB80-10341
ISSN-0141-4089 ..... PB80-10341

JPRS-73882 ..... PB80-10993 #
JPRS-74125 ..... PB80-10269 #
JPRS-74365 ..... PB80-10748 #
JPRS-74470 ..... PB80-10752 #

JSC-16064 ..... PB80-10907*#
JSC-16074 ..... PB80-10150*#
JSC-16079 ..... PB80-10835*#

L-12514 ..... PB80-10101*#
L-12661 ..... PB80-10102*#
L-12778 ..... PB80-10512*#
L-13030 ..... PB80-10193*#
L-13032 ..... PB80-10105*#
L-13043 ..... PB80-10106*#
L-13209 ..... PB80-10854*#

LA-TR-79-10 ..... PB80-10352 #

LA-UR-78-2556 ..... PB80-10646 #
LA-UR-78-2720 ..... PB80-10381 #
LA-UR-78-2861 ..... PB80-10645 #
LA-UR-78-2992 ..... PB80-10715 #
LA-UR-78-3169 ..... PB80-10467 #
LA-UR-79-218 ..... PB80-10951 #
LA-UR-79-309 ..... PB80-10984 #
LA-UR-79-361 ..... PB80-10875 #
LA-UR-79-837 ..... PB80-10841 #
LA-UR-79-950 ..... PB80-10637 #
LA-UR-79-1241 ..... PB80-10472 #
LA-UR-79-1337 ..... PB80-10649 #

LA-6953-MS ..... PB80-10443 #
LA-7029-MS ..... PB80-10912 #
LA-7326 ..... PB80-10470 #
LA-7331-MS ..... PB80-10491 #
LA-7443-MS ..... PB80-10492 #
LA-7487-C ..... PB80-10716 #
LA-7491-C ..... PB80-10830 #
LA-7560-PR ..... PB80-10806 #
LA-7590-P ..... PB80-10911 #
LA-7700-MS ..... PB80-10851 #
LA-7727-T ..... PB80-10335 #

LBL-7294 ..... PB80-10483 #
LBL-7882 ..... PB80-10621 #
LBL-7893 ..... PB80-10611 #
LBL-7953 ..... PB80-10831 #
LBL-7977 ..... PB80-10887 #
LBL-8275 ..... PB80-10424 #
LBL-8332 ..... PB80-10688 #
LBL-8750 ..... PB80-10894 #
LBL-8900 ..... PB80-10869 #
LBL-8936 ..... PB80-10895 #

LC-77-10824 ..... PB80-10643 #
LC-77-10824 ..... PB80-10946 #
LC-78-606163 ..... PB80-10392 #

LG79E80011 ..... PB80-10503 #

LIDS-TH-911 ..... PB80-10963 #
LIDS-TH-951 ..... PB80-10814*#

LSI-ER-312-8 ..... PB80-10801*#
LSI-ER-319-24 ..... PB80-10800*#

MCOR/EBYR/CO-78/2 ..... PB80-10786 #

MDC-E2104-VOL-1 ..... PB80-10266*#
MDC-E2104-VOL-2 ..... PB80-10267*#
MDC-E2104-VOL-3 ..... PB80-10268*#

MDC-37733 ..... PB80-10134*#

METC/BI-79/4 ..... PB80-10386 #

MIMEO-SEB-1177 ..... PB80-10839 #

MML-67 ..... PB80-10513 #

NBC-DA-861 ..... N80-10707 #

NSWW-78-3043-2-R-2 ..... N80-10408 #

NSRE-437 ..... N80-10821 #
NSRP-438 ..... N80-10820 #
NSRR-439 ..... N80-10837 #

NTB-79N00137 ..... N80-10701 #

NADC-76153-30 ..... N80-10122*#
NADC-78220-60 ..... N80-10347 #

NASA-CASE-MFS-23642-1 ..... N80-10278*

NASA-CASE-MSC-14903-2 ..... N80-10358*
NASA-CASE-MSC-16182-1 ..... N80-10799*
NASA-CASE-MSC-16370-1 ..... N80-10413*#

NASA-CASE-NPO-13758-2 ..... N80-10377*#
NASA-CASE-NPO-13849-1 ..... N80-10378*
NASA-CASE-NPO-13907-1 ..... N80-10374*
NASA-CASE-NPO-14192-1 ..... N80-10587*
NASA-CASE-NPO-14231-1 ..... N80-10709*
NASA-CASE-NPO-14315-1 ..... N80-10361*#
NASA-CASE-NPO-14384-1 ..... N80-10498*

NASA-CP-2092 ..... N80-10205*#
NASA-CP-2093 ..... N80-10107*#

NASA-CR-3187 ..... N80-10103*#
NASA-CR-150618 ..... N80-10602*#
NASA-CR-150706 ..... N80-10601*#
NASA-CR-152308 ..... N80-10148*#
NASA-CR-158950-VOL-4 ..... N80-10149*#
NASA-CR-159090 ..... N80-10962*#
NASA-CR-159132 ..... N80-10859*#
NASA-CR-159144 ..... N80-10231*#
NASA-CR-159146 ..... N80-10876*#
NASA-CR-159147 ..... N80-10434*#
NASA-CR-159149 ..... N80-10195*#
NASA-CR-159411 ..... N80-10622*#
NASA-CR-159570 ..... N80-10134*#
NASA-CR-159585 ..... N80-10318*#
NASA-CR-159676 ..... N80-10319*#
NASA-CR-159681 ..... N80-10515*#
NASA-CR-159686 ..... N80-10415*#
NASA-CR-159687 ..... N80-10416*#
NASA-CR-159694 ..... N80-10221*#
NASA-CR-159702 ..... N80-10460*#
NASA-CR-159705 ..... N80-10603*#
NASA-CR-159730 ..... N80-10222*#
NASA-CR-160316 ..... N80-10275*#
NASA-CR-160317 ..... N80-10080*#
NASA-CR-160318 ..... N80-10378*#
NASA-CR-160320 ..... N80-10600*#
NASA-CR-160332 ..... N80-10801*#
NASA-CR-160348 ..... N80-10228*#
NASA-CR-160349 ..... N80-10437*#
NASA-CR-160352 ..... N80-10836*#
NASA-CR-160353 ..... N80-10782*#
NASA-CR-161283 ..... N80-10277*#
NASA-CR-161321 ..... N80-10514*#
NASA-CR-161322 ..... N80-10379*#
NASA-CR-161323 ..... N80-10604*#
NASA-CR-161324 ..... N80-10266*#
NASA-CR-161325 ..... N80-10267*#
NASA-CR-161326 ..... N80-10268*#
NASA-CR-162251 ..... N80-10457*#
NASA-CR-162252 ..... N80-10979*#
NASA-CR-162253 ..... N80-10980*#
NASA-CR-162254 ..... N80-10204*#
NASA-CR-162365 ..... N80-10711*#
NASA-CR-162386 ..... N80-10978*#
NASA-CR-162387 ..... N80-10597*#
NASA-CR-162388 ..... N80-10852*#
NASA-CR-162389 ..... N80-10330*#
NASA-CR-162398 ..... N80-10598*#
NASA-CR-162399 ..... N80-10713*#
NASA-CR-162400 ..... N80-10137*#
NASA-CR-162409 ..... N80-10687*#
NASA-CR-162414 ..... N80-10240*#
NASA-CR-162415 ..... N80-10986*#
NASA-CR-162416 ..... N80-10814*#
NASA-CR-162417 ..... N80-10596 #
NASA-CR-162418 ..... N80-10461*#
NASA-CR-162419 ..... N80-10220*#

NASA-SP-360 ..... N80-10537*#
NASA-SP-412-VOL-2 ..... N80-10538*#
NASA-SP-5021(18) ..... N80-10969*#
NASA-SP-5021(19) ..... N80-10968*#
NASA-SP-5021(20) ..... N80-10967*#
NASA-SP-7011(198) N80-10778*

NASA-TM-72870 ..... N80-10274*#
NASA-TM-75490 ..... N80-10459*#
NASA-TM-75629 ..... N80-10265*#
NASA-TM-75633 ..... N80-10900*#
NASA-TM-75644 ..... N80-10470*#
NASA-TM-75666 ..... N80-10914*#
NASA-TM-75667 ..... N80-10273*#
NASA-TM-75668 ..... N80-10497*#
NASA-TM-75671 ..... N80-10477*#
NASA-TM-75679 ..... N80-10982*#
NASA-TM-75680 ..... N80-10813*#
NASA-TM-75685 ..... N80-10983*#
NASA-TM-75686 ..... N80-10866*#
NASA-TM-75692 ..... N80-10745*#
NASA-TM-75693 ..... N80-10435*#
NASA-TM-75698 ..... N80-10915*#
NASA-TM-75698 ..... N80-10317*#
NASA-TM-75708 ..... N80-10686*#
NASA-TM-75711 ..... N80-10104*#
NASA-TM-75716 ..... N80-10988*#
NASA-TM-75717 ..... N80-10989*#
NASA-TM-75918 ..... N80-10982*#
NASA-TM-75920 ..... N80-10991*#
NASA-TM-75921 ..... N80-10990*#
NASA-TM-79202 ..... N80-10594*#
NASA-TM-79205 ..... N80-10384*#
NASA-TM-79249 ..... N80-10595*#
NASA-TM-80119 ..... N80-10685*#
NASA-TM-80129 ..... N80-10106*#
NASA-TM-80143 ..... N80-10850*#
NASA-TM-80152 ..... N80-10135*#
NASA-TM-80159 ..... N80-10433*#
NASA-TM-80163 ..... N80-10225*#
NASA-TM-80165 ..... N80-10136*#
NASA-TM-80167 ..... N80-10152*#
NASA-TM-80170 ..... N80-10458*#
NASA-TM-80349 ..... N80-10956*#
NASA-TM-80803 ..... N80-10907*#
NASA-TM-80804 ..... N80-10150*#
NASA-TM-80806 ..... N80-10835*#
NASA-TM-80807 ..... N80-10239*#
NASA-TM-80808 ..... N80-10272*#
NASA-TM-81153 ..... N80-10516*#

NASA-TP-1330 ..... N80-10101*#
NASA-TP-1421 ..... N80-10102*#
NASA-TP-1477 ..... N80-10512*#
NASA-TP-1500 ..... N80-10105*#
NASA-TP-1537 ..... N80-10193*#

NBS-DIR-83-3 ..... N80-10905 #

NBS-TN-910-4 ..... N80-10740 #

NBS/DIR-83/6 ..... N80-10975 #
NBS/GCR-79/172 ..... N80-10407 #

NBSIR-79-1598 ..... N80-10372 #
NBSIR-79-1754 ..... N80-10474 #
NBSIR-79-1758 ..... N80-10406 #
NBSIR-79-1766 ..... N80-10371 #
NBSIR-80-1778 ..... N80-10676 #

NCAR-CT-49 ..... N80-10719 #

NIOSH-79/110 ..... N80-10787 #

NOAA-TR-ERL-PMEL-13 ..... N80-10743 #

NOAA-79050811 ..... N80-10587 #
NOAA-79052401 ..... N80-10718 #
NOAA-79060402 ..... N80-10742 #
NOAA-79061310 ..... N80-10743 #

NOSC/TR-380 ..... N80-10793 #

NRL-MR-3884-VOL-1 ..... N80-10862 #
NRL-MR-4019 ..... N80-10489 #
NRL-MR-4043 ..... N80-10520 #

NPO92-549-TR07 ..... N80-10867 #

BSC-PS-AMR-77001 ..... N80-10891 #

BSF/BA-780549 ..... N80-10675 #
BSF/BA-780561 ..... N80-10973 #
BSF/BA-790038 ..... N80-10337 #
BSF/BA-790046 ..... N80-10897 #
BSF/BA-790074 ..... N80-10976 #

BSRDS-BRS-61-PT-2 ..... N80-10643 #
BSRDS-BRS-61-PT-3 ..... N80-10946 #

BSSDC/NDC-A-PGS-79-05 ..... N80-10956*#

BSRC/WOL/TR-78-189 ..... N80-10138 #

BTIS/PS-76/116 ..... N80-10948 #
BTIS/PS-75/239 ..... N80-10445 #
BTIS/PS-75/422 ..... N80-10325 #
BTIS/PS-75/445 ..... N80-10670 #
BTIS/PS-75/467 ..... N80-10531 #
BTIS/PS-75/471 ..... N80-10672 #
BTIS/PS-75/472 ..... N80-10682 #
BTIS/PS-75/591 ..... N80-10940 #
BTIS/PS-76/0254 ..... N80-10445 #
BTIS/PS-76/0255 ..... N80-10446 #
BTIS/PS-76/0429 ..... N80-10506 #
BTIS/PS-76/0446 ..... N80-10673 #
BTIS/PS-76/0447 ..... N80-10674 #
BTIS/PS-76/0466 ..... N80-10670 #
BTIS/PS-76/0513 ..... N80-10325 #
BTIS/PS-76/0543 ..... N80-10672 #
BTIS/PS-76/0548 ..... N80-10666 #
BTIS/PS-76/0549 ..... N80-10682 #
BTIS/PS-76/0550 ..... N80-10681 #
BTIS/PS-76/0554 ..... N80-10531 #
BTIS/PS-76/0681 ..... N80-10940 #
BTIS/PS-77/0288 ..... N80-10445 #
BTIS/PS-77/0290 ..... N80-10446 #
BTIS/PS-77/0409 ..... N80-10506 #
BTIS/PS-77/0514 ..... N80-10673 #
BTIS/PS-77/0515 ..... N80-10674 #
BTIS/PS-77/0555 ..... N80-10670 #
BTIS/PS-77/0612 ..... N80-10325 #
BTIS/PS-77/0633 ..... N80-10682 #
BTIS/PS-77/0638 ..... N80-10681 #
BTIS/PS-77/0638 ..... N80-10672 #
BTIS/PS-77/0639 ..... N80-10666 #
BTIS/PS-77/0645 ..... N80-10531 #
BTIS/PS-77/0744 ..... N80-10948 #
BTIS/PS-78/0298 ..... N80-10445 #
BTIS/PS-78/0299 ..... N80-10446 #
BTIS/PS-78/0568 ..... N80-10506 #
BTIS/PS-78/0571 ..... N80-10673 #
BTIS/PS-78/0572 ..... N80-10674 #
BTIS/PS-78/0618 ..... N80-10670 #
BTIS/PS-78/0660 ..... N80-10672 #
BTIS/PS-78/0661 ..... N80-10666 #
BTIS/PS-78/0684 ..... N80-10325 #
BTIS/PS-78/0689 ..... N80-10682 #
BTIS/PS-78/0690 ..... N80-10681 #
BTIS/PS-78/0767 ..... N80-10948 #
BTIS/PS-78/0768 ..... N80-10531 #
BTIS/PS-79/0618/3 ..... N80-10445 #
BTIS/PS-79/0620/9 ..... N80-10446 #
BTIS/PS-79/0631/6 ..... N80-10673 #
BTIS/PS-79/0632/4 ..... N80-10674 #
BTIS/PS-79/0636/5 ..... N80-10505 #
BTIS/PS-79/0637/3 ..... N80-10506 #
BTIS/PS-79/0646/4 ..... N80-10669 #
BTIS/PS-79/0647/2 ..... N80-10670 #
BTIS/PS-79/0674/6 ..... N80-10671 #
BTIS/PS-79/0675/3 ..... N80-10672 #
BTIS/PS-79/0676/1 ..... N80-10666 #
BTIS/PS-79/0680/3 ..... N80-10324 #
BTIS/PS-79/0681/1 ..... N80-10325 #
BTIS/PS-79/0733/0 ..... N80-10580 #
BTIS/PS-79/0764/5 ..... N80-10668 #
BTIS/PS-79/0765/2 ..... N80-10667 #
BTIS/PS-79/0771/0 ..... N80-10397 #
BTIS/PS-79/0772/8 ..... N80-10402 #
BTIS/PS-79/0773/6 ..... N80-10401 #
BTIS/PS-79/0780/1 ..... N80-10682 #
BTIS/PS-79/0781/9 ..... N80-10680 #
BTIS/PS-79/0782/7 ..... N80-10681 #
BTIS/PS-79/0795/9 ..... N80-10947 #
BTIS/PS-79/0796/7 ..... N80-10948 #
BTIS/PS-79/0803/1 ..... N80-10530 #
BTIS/PS-79/0804/9 ..... N80-10531 #

BTIS/PS-79/0812/2 ..... N80-10145 #
BTIS/PS-79/0813/0 ..... N80-10146 #

BURRO-CR-0429 ..... N80-10884 #
BURRO-CR-0507-80L-3 ..... N80-10527 #
BURRO-CR-0648 ..... N80-10469 #

BUSC-TR-6045 ..... N80-10834 #

CAQPS-1.2-121 ..... N80-10706 #

CAR-CR215-258-1 ..... N80-10140 #

CAR-TR-2 ..... N80-10364 #
CAR-TR-139 ..... N80-10848 #
CAR-TR-142 ..... N80-10867 #

CARL-TR-4664 ..... N80-10921 #

CARL-5332 ..... N80-10950 #
CARL-5537 ..... N80-10955 #

CARL/CSD/TR-80 ..... N80-10785 #
CARL/BURRO-10/83 ..... N80-10527 #
CARL/TR-5758 ..... N80-10627 #
CARL/TR-6284 ..... N80-10647 #
CARL/TR-6358 ..... N80-10739 #
CARL/TR-6822 ..... N80-10357 #

CBO-3992-346 ..... N80-10882 #
CBO-3992-354 ..... N80-10949 #
CBO-4043-38 ..... N80-10881 #
CBO-4881-23 ..... N80-10660 #
CBO-5126-50 ..... N80-10842 #

CCUDF-761251/711374 ..... N80-10861 #

CC-AMRE-79-8 ..... N80-10320 #
CC-AMRE-79-9 ..... N80-10321 #
CC-AMRE-79-11 ..... N80-10322 #

CHRT-A-048-IND(1) ..... N80-10589 #
CHRT-A-092-WASH(1) ..... N80-10591 #

CHRT-B-045-NICH(1) ..... N80-10590 #
CHRT-B-050-KY(1) ..... N80-10703 #

PAPER-77-030 ..... N80-10104*#

PB-295756/1 ..... N80-10695 #
PB-295780/1 ..... N80-10972 #
PB-295988/9 ..... N80-10973 #
PB-296047/4 ..... N80-10740 #
PB-296390/8 ..... N80-10696 #
PB-296403/9 ..... N80-10590 #
PB-296485/6 ..... N80-10337 #
PB-296499/7 ..... N80-10591 #
PB-296523/4 ..... N80-10398 #
PB-296527/5 ..... N80-10705 #
PB-296623/2 ..... N80-10677 #
PB-296629/0 ..... N80-10396 #
PB-296627/3 ..... N80-10786 #
PB-296628/2 ..... N80-10679 #
PB-296642/2 ..... N80-10897 #
PB-296650/5 ..... N80-10400 #
PB-296712/3 ..... N80-10587 #
PB-296733/9 ..... N80-10405 #
PB-296813/9 ..... N80-10974 #
PB-296835/2 ..... N80-10699 #
PB-296838/6 ..... N80-10698 #
PB-296908/7 ..... N80-10697 #
PB-296912/9 ..... N80-10407 #
PB-296968/1 ..... N80-10473 #
PB-296969/9 ..... N80-10678 #
PB-297065/5 ..... N80-10741 #
PB-297131/5 ..... N80-10592 #
PB-297135/6 ..... N80-10742 #
PB-297195/0 ..... N80-10718 #
PB-297206/5 ..... N80-10589 #
PB-297209/9 ..... N80-10703 #
PB-297310/5 ..... N80-10338 #
PB-297385/7 ..... N80-10719 #
PB-297396/4 ..... N80-10676 #
PB-297421/0 ..... N80-10743 #
PB-297429/3 ..... N80-10408 #
PB-297439/2 ..... N80-10708 #
PB-297491/3 ..... N80-10707 #
PB-297504/3 ..... N80-10977 #
PB-297576/1 ..... N80-10702 #

PB-297587/8 ..... NBS-10700 #
PB-297593/6 ..... NBS-10976 #
PB-297604/1 ..... NBS-10832 #
PB-297618/1 ..... NBS-10701 #
PB-297671/0 ..... NBS-10372 #
PB-297708/0 ..... NBS-10406 #
PB-297755/1 ..... NBS-10704 #
PB-297775/9 ..... NBS-10787 #
PB-297793/2 ..... NBS-10371 #
PB-297800/5 ..... NBS-10706 #
PB-297807/0 ..... NBS-10399 #
PB-297836/9 ..... NBS-10975 #
PB-297847/6 ..... NBS-10946 #
PB-297987/0 ..... NBS-10529 #
PB-298053/0 ..... NBS-10478 #
PB-298168/6 ..... NBS-10675 #
PB-298243/7 ..... NBS-10744 #

PM-692 ..... NBS-10362 #

PML-2711 ..... NBS-10625 #
PML-2763 ..... NBS-10613 #
PML-2768 ..... NBS-10382 #

PPPL-1517 ..... NBS-10444 #

PPSP/PPRP-24 ..... NBS-10695 #

PR-1 ..... NBS-10628 #
PR-29 ..... NBS-10421 #
PR-321 ..... NBS-10477#1
PR-338 ..... NBS-10988#1
PR-343 ..... NBS-10989#1
PR-344 ..... NBS-10991#1
PR-347 ..... NBS-10983#1
PR-351 ..... NBS-10990#1
PR-412 ..... NBS-10998#1
PR-421 ..... NBS-10982#1
PR-436 ..... NBS-10478#1
PR-443 ..... NBS-10686#1
PR-461 ..... NBS-10866#1
PR-462 ..... NBS-10981#1
PR-476 ..... NBS-10813#1

PREPRINT-26 ..... NBS-10497#1

PVA-5296 ..... NBS-10204#1
PVA-5501 ..... NBS-10220#1
PVA-5512-85 ..... NBS-10515#1
PVA-5513-32 ..... NBS-10221#1
PVA-5630-11 ..... NBS-10222#1

QPR-3 ..... NBS-10598#1
QPR-14 ..... NBS-10597#1

QR-1 ..... NBS-10487 #
QR-3 ..... NBS-10603#1

R-1456 ..... NBS-58228 #

RADC-TR-79-95 ..... NBS-10939 #
RADC-TR-79-110 ..... NBS-10420 #
RADC-TR-79-131 ..... NBS-10736 #

RAE-TRANS-2007 ..... NBS-10436 #
RAE-TRANS-2012 ..... NBS-10232 #
RAE-TRANS-2016 ..... NBS-10517 #

RAND/R-2257-DOE ..... NBS-10634 #
RAND/R-2335-DOE ..... NBS-10636 #

RE-582 ..... NBS-10194 #
RE-586 ..... NBS-10329 #

REPT-5-420-71-780-09 ..... NBS-10986#1
REPT-74 ..... NBS-10836#1
REPT-79-PR-27 ..... NBS-10907#1
REPT-79-TR-30 ..... NBS-10150#1
REPT-79-TR-31 ..... NBS-10835#1
REPT-79-270-2 ..... NBS-10852#1
REPT-7901 ..... NBS-10792 #
REPT-80387-6016-RU-00 ..... NBS-10277#1

RHO-SA-107 ..... NBS-10504 #

RM-690 ..... NBS-10418 #

RR-1-79 ..... NBS-10791 #
RR-10 ..... NBS-10592 #

RR-120 ..... NBS-10703 #

R79-2 ..... NBS-10228#1
R79-914364-12 ..... NBS-10319#1
F7908-5 ..... NBS-10275#1

SA-ALC/MMR-76-6-38-1 ..... NBS-10503 #

SAMSO-TR-79-44 ..... NBS-10331 #
SAMSO-TR-79-65 ..... NBS-10462 #

SAN-1599-1/3-VOL-3 ..... NBS-10654 #
SAN-1592-1 ..... NBS-10658 #

SAND-77-1663C ..... NBS-10528 #
SAND-78-0235 ..... NBS-10893 #
SAND-78-1267 ..... NBS-10886 #
SAND-78-1625 ..... NBS-10487 #
SAND-78-1812C ..... NBS-10797 #
SAND-78-1982 ..... NBS-10466 #
SAND-78-1961C ..... NBS-10959 #
SAND-78-2086C ..... NBS-10608 #
SAND-78-2282C ..... NBS-10642 #
SAND-78-2292C ..... NBS-10609 #
SAND-78-8020 ..... NBS-10626 #
SAND-78-8180 ..... NBS-10612 #
SAND-78-8188 ..... NBS-10616 #
SAND-78-8272 ..... NBS-10384 #
SAND-78-8684 ..... NBS-10916 #
SAND-79-0045C ..... NBS-10351 #
SAND-79-0059C ..... NBS-10892 #
SAND-79-0090 ..... NBS-10641 #
SAND-79-0158C ..... NBS-10370 #
SAND-79-0182 ..... NBS-10971 #
SAND-79-0193C ..... NBS-10501 #
SAND-79-0418 ..... NBS-10640 #
SAND-79-0504C ..... NBS-10638 #
SAND-79-0709 ..... NBS-10336 #
SAND-79-0894C ..... NBS-10144 #
SAND-79-7005 ..... NBS-10650 #

SATP-7 ..... NBS-10734 #

SCS-LS-900 ..... NBS-10789 #

SERI/TP-35-208 ..... NBS-10663 #

SERIS-RMR-79-39 ..... NBS-10344 #

SLAC-PUB-2167 ..... NBS-10856 #
SLAC-PUB-2219 ..... NBS-10863 #
SLAC-PUB-2258 ..... NBS-10895 #
SLAC-PUB-2295 ..... NBS-10423 #

SOLAR/1010-78/14 ..... NBS-10659 #

SR-1 ..... NBS-10513 #
SR-2 ..... NBS-10614 #

SRD-79-018 ..... NBS-10369 #

STAR-CS-78-684 ..... NBS-10835 #

STI-TR-1110-1 ..... NBS-10235 #

SWRI-85-662 ..... NBS-10223 #

TARADCOM-TR-12412 ..... NBS-10817 #

TFBP-TR-285 ..... NBS-10482 #

TID-28818 ..... NBS-10895 #
TID-28927 ..... NBS-10615 #
TID-29400/1 ..... NBS-10395 #

TR-BR-899 ..... NBS-10840 #

TR-1978-44 ..... NBS-10417 #

TPS-78-798 ..... NBS-10692 #

TP759.C52 ..... NBS-10392 #

TR-2 ..... NBS-10320 #
TR-2 ..... NBS-10366 #
TR-3 ..... NBS-10321 #
TR-9 ..... NBS-10519 #
TR-15 ..... NBS-10791 #
TR-17 ..... NBS-10363 #

TR-10 ..... NBS-10844 *
TR-27-7-79 ..... NBS-10795 *
TR-29 ..... NBS-10333 *
TR-30 ..... NBS-10345 *
TR-32 ..... NBS-10582 *
TR-39 ..... NBS-10823 *
TR-57 ..... NBS-10591 *
TR-79-3 ..... NBS-10742 *
TR-79-6-001 ..... NBS-10819 *
TR-79-83 ..... NBS-10742 *
TR-79-388100-7 ..... NBS-10825 *
TR-112-1 ..... NBS-10746 *
TR-116 ..... NBS-10589 *
TR-137-088 ..... NBS-10850 *
TR-138-088 ..... NBS-10849 *
TR-686 ..... NBS-10805 *
TR-787-P ..... NBS-10790 *
TR-0079(4768)-2 ..... NBS-10331 *
TR-0079(4940-01)-5 ..... NBS-10462 *
TR-3275-79-1 ..... NBS-10523 *
TR-3275-79-2 ..... NBS-10524 *
TR-3275-79-3 ..... NBS-10525 *

TREE-1350 ..... NBS-10469 *

TTB-ESR-79-2 ..... NBS-10139 *

U-OF-IOWA-79-04 ..... NBS-10907 *

UAG-71 ..... NBS-10718 *

UC-22 ..... NBS-10491 *

UCB/EEL-79/1 ..... NBS-10438 *

UCID-18015 ..... NBS-10827 *
UCID-18016 ..... NBS-10471 *
UCID-18070 ..... NBS-10526 *
UCID-18072 ..... NBS-10857 *
UCID-18201 ..... NBS-10493 *

UCRL-TRANS-11473 ..... NBS-10924 *

UCRL-13891-3 ..... NBS-10798 *
UCRL-13950 ..... NBS-10877 *
UCRL-13984 ..... NBS-10689 *
UCRL-15003 ..... NBS-10619 *
UCRL-15005 ..... NBS-10623 *
UCRL-52553-101-1 ..... NBS-10970 *
UCRL-52634 ..... NBS-10942 *
UCRL-81289 ..... NBS-10279 *
UCRL-81365 ..... NBS-10490 *
UCRL-81812 ..... NBS-10688 *
UCRL-82034 ..... NBS-10385 *
UCRL-82533 ..... NBS-10440 *
UCRL-82542 ..... NBS-10717 *
UCRL-82710 ..... NBS-10664 *

UR-511-329-79 ..... NBS-10952 *

URD-PP-79-032 ..... NBS-10842 *

URD-TR-79-010 ..... NBS-10842 *

US-PATENT-APPL-SR-061556 ..... NBS-10413**
US-PATENT-APPL-SR-668783 ..... NBS-10374*
US-PATENT-APPL-SR-706424 ..... NBS-10358*
US-PATENT-APPL-SR-727444 ..... NBS-10377**
US-PATENT-APPL-SR-780938 ..... NBS-10799*
US-PATENT-APPL-SR-830562 ..... NBS-10587*
US-PATENT-APPL-SR-880728 ..... NBS-10494*
US-PATENT-APPL-SR-900659 ..... NBS-10361**
US-PATENT-APPL-SR-903019 ..... NBS-10709*
US-PATENT-APPL-SR-907435 ..... NBS-10358*
US-PATENT-APPL-SR-923758 ..... NBS-10278*

US-PATENT-CLASS-23-2888 ..... NBS-10374*
US-PATENT-CLASS-48-DIG.8 ..... NBS-10374*
US-PATENT-CLASS-48-10-3 ..... NBS-10374*
US-PATENT-CLASS-48-61 ..... NBS-10374*
US-PATENT-CLASS-48-102A NBS-10374*
US-PATENT-CLASS-48-107 ..... NBS-10374*
US-PATENT-CLASS-48-117 ..... NBS-10374*
US-PATENT-CLASS-60-300 ..... NBS-10374*
US-PATENT-CLASS-60-606 ..... NBS-10374*
US-PATENT-CLASS-73-155 ..... NBS-10709*
US-PATENT-CLASS-123-DIG.12 ..... NBS-10374*
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